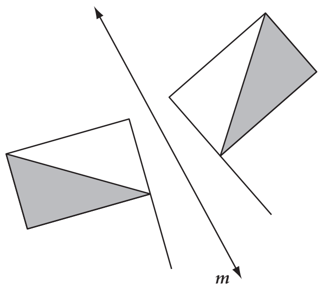
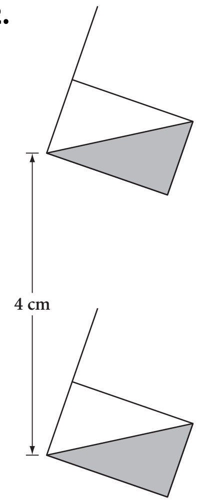
CHAPTER 7 • Quiz 1 — Form B

1.



2.



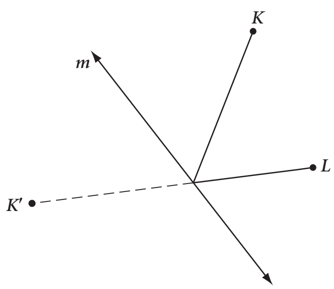
3. C **4.** B **5.** Answers will vary.

6. Translation left 4 units

7. Reflection across the line $y = x$

8. $(x, y) \rightarrow (-x, y)$

9.

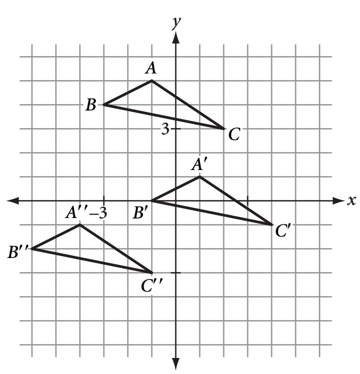


CHAPTER 7 • Quiz 2 — Form A

1. False **2.** True **3.** False **4.** False

5. True

6. a.



b. $(x, y) \rightarrow (x - 3, y - 6)$

c. $(x, y) \rightarrow (x + 3, y + 6)$

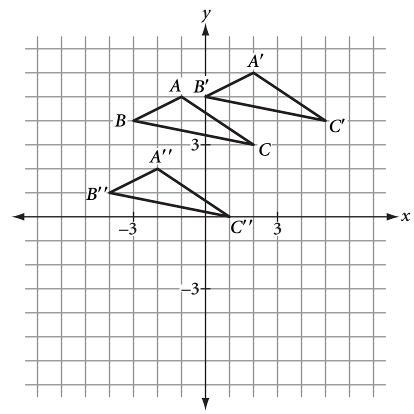
7. 4.6.12 **8.** 3.6.3.6

CHAPTER 7 • Quiz 2 — Form B

1. True **2.** False **3.** False **4.** True

5. False

6. a.



b. $(x, y) \rightarrow (x - 1, y - 3)$

c. $(x, y) \rightarrow (x + 1, y + 3)$

7. 3.4.6.4 **8.** 3.6.3.6

CHAPTER 7 • Test — Form A

Part A

1. True **2.** True **3.** False **4.** True

5. False

Part B

1. Answers will vary. **2.** Answers will vary.

Part C

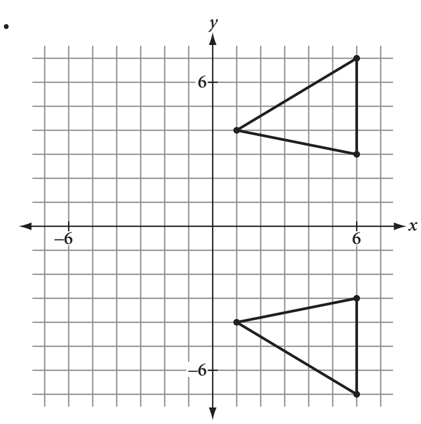
1. 3.4.6.4 **2.** 3.3.3.3.6 (or 3^4.6)

Part D

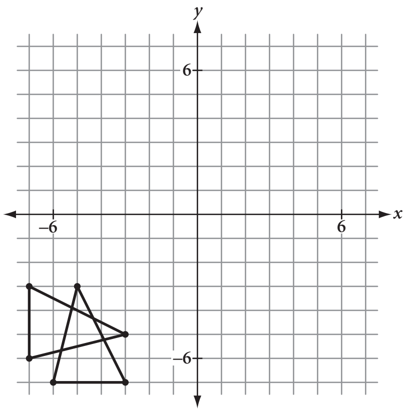
1. Glide reflection **2.** Translation

Part E

1.



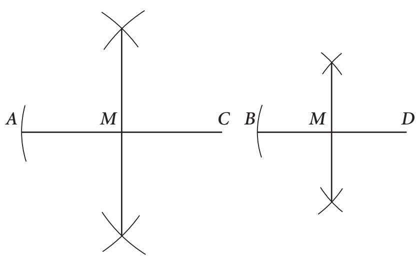
2.

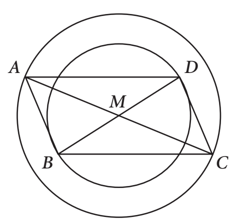


MIXED REVIEW

1. $a = 33°$ **2.** $b = 90°$ **3.** $c = 114°$ **4.** $d = 21°$

5. Answers will vary. One possible answer:

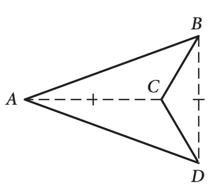




6. $y = \frac{1}{2}x - 5$ **7.** True

8. True

9. False; Possible counterexample: Concave quadrilateral $ABCD$ has congruent diagonals and is not a rectangle.



10. False; A circle can be constructed through any three non-collinear points, but not through three collinear points.

11. Given

12. Alternate Interior Angles Conjecture

13. Vertical Angles Conjecture

14. $\triangle ABC \cong \triangle EDC$

15. ASA

16. CPCTC

CHAPTER 7 • Test Form B

PART A

1. True **2.** True **3.** False **4.** True

5. True

PART B

1. Answers will vary. **2.** Answers will vary.

PART C

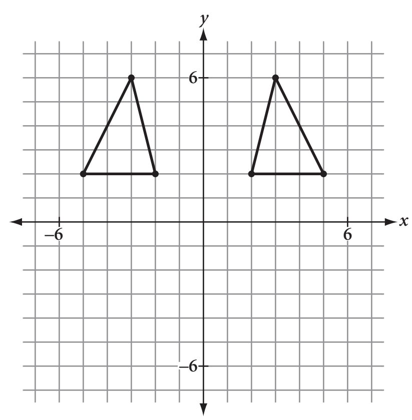
1. 3.3.4.3.4 or 3^2.4.3.4 **2.** 4.6.12

PART D

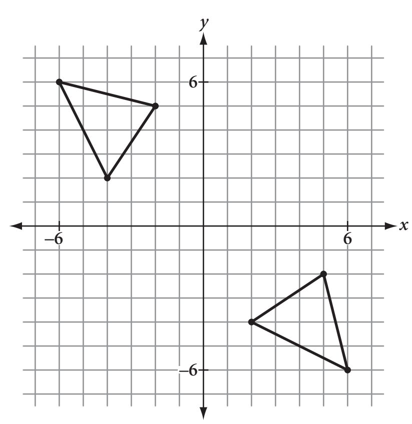
1. Translation **2.** Rotation

PART E

1.



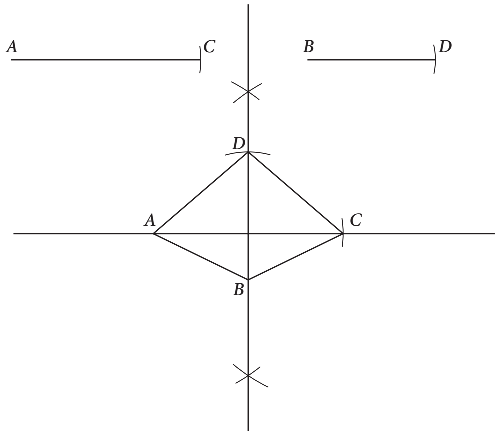
2.



Mixed review

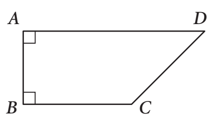
1. $a = 62°$ **2.** $b = 110°$ **3.** $c = 101°$ **4.** $d = 42°$

5. Answers will vary. One possible answer:



6. $y = \frac{2}{3}x - 6$ **7.** True **8.** True

9. False; In the trapezoid below, $\angle A \cong \angle B$ because they both have measure 90°, but the trapezoid is not isosceles.



10. False; In an isosceles triangle, a median and altitude are the same, but the triangle is not necessarily equilateral.

11. Given

12. Alternate Interior Angles Conjecture

13. Alternate Interior Angles Conjecture

14. $\triangle ABC \cong \triangle EDC$

15. ASA **16.** CPCTC

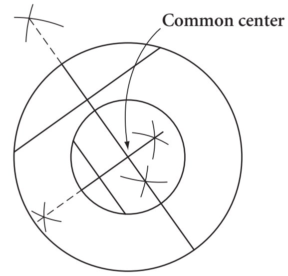
CHAPTER 7 • Constructive Assessment Options

Scoring rubrics

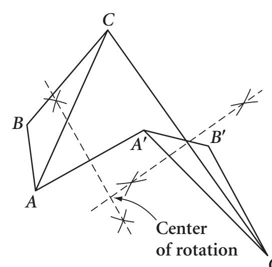
1. 5 Points

All answers and explanations are clear and correct.

a. Explanation should be similar to the following: Construct the perpendicular bisector of each chord. Each bisector passes through the center of its chord's circle. However, because both circles have the same center, the perpendicular bisectors must intersect at the common center.



b. Explanation should be similar to the following: A maps to A' along an arc of a circle with center at the center of rotation. Similarly, C maps to C' along an arc of a circle with the same center. These two circles are concentric, and $\overline{AA'}$ is a chord of one circle and $\overline{CC'}$ is a chord of the other. So, to find the center of rotation, construct the perpendicular bisectors of $\overline{AA'}$ and $\overline{CC'}$. The intersection of the perpendicular bisectors is the common center of the concentric circles, so it is the center of rotation.



3 Points

Answers and explanations are clear and correct, but construction tools were not used to locate the centers. Or, centers are correct and were located with construction tools, but explanations are missing one or two points or are somewhat unclear.

1 Point

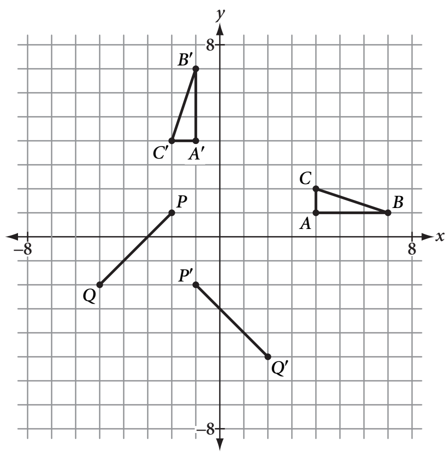
The center of the concentric circles is correctly located, but the explanation of the method is missing or unclear. Student makes no attempt to locate the center of rotation of the triangles or uses an incorrect technique to locate the center.

2. 5 Points

Transformations and rule are completed correctly.

$A(4, 1) \rightarrow A'(-1, 4)$; $B(7, 1) \rightarrow B'(-1, 7)$; $C(4, 2) \rightarrow C'(-2, 4)$

The ordered pair rule $(x, y) \rightarrow (-y, x)$ is a 90° rotation counterclockwise about the origin. $\overline{PQ}$ will vary, but $\overline{P'Q'}$ shows a correct application of the rule.



3 Points
$\triangle ABC$ and $\triangle A'B'C'$ are plotted correctly. The mappings for points A, B, and C are correct. The conjecture is correct, but it is not tested or the test is not correct.

1 Point
$\triangle ABC$ and $\triangle A'B'C'$ are plotted correctly. The mappings for points A, B, and C are correct. The conjecture is not completed or is completed incorrectly.

3. 5 Points
All answers are correct.

a. $(x, y) \rightarrow (x - 8, y + 8)$

b. 90° counterclockwise rotation about the origin

c. Reflection across the line $y = x$

d. Possible answer: $(x, y) \rightarrow (x + 1, y + 2)$ followed by $(x, y) \rightarrow (x - 3, y + 7)$ followed by $(x, y) \rightarrow (x - 6, y - 1)$

e. Possible answers: Reflect across the y-axis $(x = 0)$, and then reflect across $y = -x$. Or, reflect across $x = 4$, and then reflect across $y = 4$.

f. Possible answer: Reflect across $y = x - 4$, and then reflect across $y = x + 4$.

3 Points
Answers to parts a–c are correct, and one of the following is true:

- Answers for parts d–f are attempted, and work indicates that student was on the right track, but the answers are incorrect or incomplete.
- *Either* the answer to part d is correct *or* the answer to part e is correct. The other answer is missing or is incorrect.

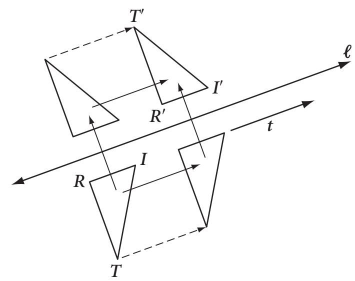
1 Point
Two answers are correct.

4. 5 Points
The work for both cases is correct. Explanations are correct. Sample answer:

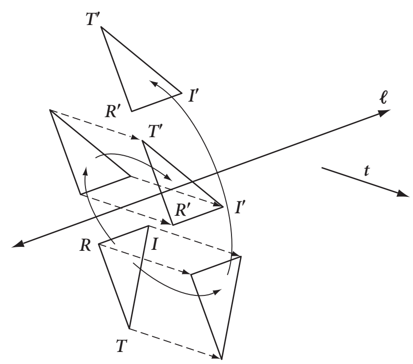
In Case 1, it does not matter which transformation is done first. The image, $\triangle T'R'I'$, is the same either way.

In Case 2, it does matter which transformation is done first. There are two different $\triangle T'R'I'$ images.

Case 1



Case 2



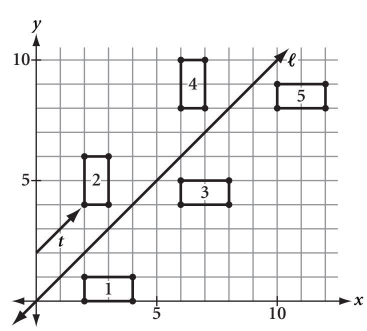
The difference between Case 1 and Case 2 is that in Case 1, the vector, t, is parallel to the reflection line, ℓ. In Case 2, it is not. Case 1 is a proper glide reflection.

3 Points
The work for Case 1 is complete and correct. The Case 2 diagram is essentially correct but may not be complete. No conclusion or reflective statement is made.

1 Point
The work for Case 1 is complete and correct. The work for Case 2 is not done or is incorrect. No conclusion or reflective statement is made.

5. 5 Points
Answers are correct.

a.



b. Equation of ℓ: $y = x$; ordered pair rule for t: $(x, y) \rightarrow (x + 2, y + 2)$

3 Points
Rectangles 4 and 5 are correctly plotted and ℓ and t are correctly sketched. The equation and/or ordered pair rule are not given.

1 Point
Rectangles 4 and 5 are correctly plotted. The rest of the answer is missing or incorrect.

6. 5 Points
Answers and examples are correct (*see below*).

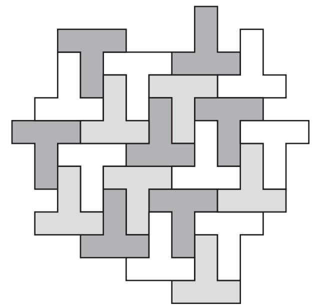
Note: Examples do not have to be in the form given below. Students may instead transform figures on graph paper.

3 Points
Three answers and examples are correct. Or, all answers are correct, but some examples are missing or incorrect.

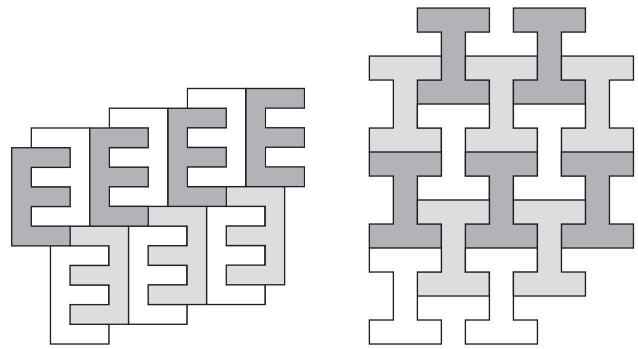
1 Point
One answer and example is correct, or some work is attempted, but few correct answers are shown.

7. 5 Points
Answers are correct.

a. The Ts can be colored with three types of shading.



b. Both tessellations can be shaded using only three types of shading.



Chapter 7, Constructive Assessment Options, Problem 6.

a. Commutative; Possible example:

$$P(1, 4) \xrightarrow{\substack{\text{Translate}\\(-2,\ +3)}} P'(-1, 7) \xrightarrow{\substack{\text{Translate}\\(+5,\ +2)}} P''(4, 9)$$

$$P(1, 4) \xrightarrow{\substack{\text{Translate}\\(+5,\ +2)}} P'(6, 6) \xrightarrow{\substack{\text{Translate}\\(-2,\ +3)}} P''(4, 9)$$

b. Not commutative; Possible example:

$$P(3, 2) \xrightarrow{\substack{\text{Reflect}\\x\text{-axis}}} P'(3, -2) \xrightarrow{\substack{\text{Translate}\\(+3,\ -4)}} P''(6, -6)$$

$$P(3, 2) \xrightarrow{\substack{\text{Translate}\\(+3,\ -4)}} P'(6, -2) \xrightarrow{\substack{\text{Reflect}\\x\text{-axis}}} P''(6, 2)$$

c. Not commutative; Possible example:

$$P(5, 3) \xrightarrow{\substack{\text{Reflect}\\x = 2}} P'(-1, 3) \xrightarrow{\substack{\text{Reflect}\\x = -3}} P''(-5, 3)$$

$$P(5, 3) \xrightarrow{\substack{\text{Reflect}\\x = -3}} P'(-11, 3) \xrightarrow{\substack{\text{Reflect}\\x = 2}} P''(15, 3)$$

d. Not commutative; Possible example:

$$P(1, 4) \xrightarrow{\substack{\text{Rotate } 90°\\\text{ccw}}} P'(-4, 1) \xrightarrow{\substack{\text{Reflect}\\y\text{-axis}}} P''(4, 1)$$

$$P(1, 4) \xrightarrow{\substack{\text{Reflect}\\y\text{-axis}}} P'(-1, 4) \xrightarrow{\substack{\text{Rotate } 90°\\\text{ccw}}} P''(-4, -1)$$

e. Not commutative; Possible example:

$$P(3, 1) \xrightarrow{\substack{\text{Rotate } 90°\\\text{ccw}}} P'(-1, 3) \xrightarrow{\substack{\text{Reflect}\\y\text{-axis}}} P''(1, 3) \xrightarrow{\substack{\text{Reflect}\\x\text{-axis}}} P'''(1, -3)$$

$$P(3, 1) \xrightarrow{\substack{\text{Rotate } 90°\\\text{ccw}}} P'(-1, 3) \xrightarrow{\substack{\text{Reflect}\\x\text{-axis}}} P''(-1, -3) \xrightarrow{\substack{\text{Reflect}\\y\text{-axis}}} P'''(1, -3)$$

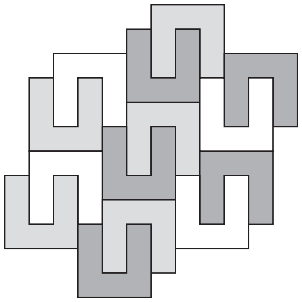
$$P(3, 1) \xrightarrow{\substack{\text{Reflect}\\x\text{-axis}}} P'(3, -1) \xrightarrow{\substack{\text{Reflect}\\y\text{-axis}}} P''(-3, -1) \xrightarrow{\substack{\text{Rotate } 90°\\\text{ccw}}} P'''(1, -3)$$

$$P(3, 1) \xrightarrow{\substack{\text{Reflect}\\x\text{-axis}}} P'(3, -1) \xrightarrow{\substack{\text{Rotate } 90°\\\text{ccw}}} P''(1, 3) \xrightarrow{\substack{\text{Reflect}\\y\text{-axis}}} P'''(-1, 3)$$

$$P(3, 1) \xrightarrow{\substack{\text{Reflect}\\y\text{-axis}}} P'(-3, 1) \xrightarrow{\substack{\text{Reflect}\\x\text{-axis}}} P''(-3, -1) \xrightarrow{\substack{\text{Rotate } 90°\\\text{ccw}}} P'''(1, -3)$$

$$P(3, 1) \xrightarrow{\substack{\text{Reflect}\\y\text{-axis}}} P'(-3, 1) \xrightarrow{\substack{\text{Rotate } 90°\\\text{ccw}}} P''(-1, -3) \xrightarrow{\substack{\text{Reflect}\\x\text{-axis}}} P'''(-1, 3)$$

c. Possible answer:



3 Points

a. Answer shows the tessellation correctly shaded with three types of shading.

b. One tessellation is drawn correctly.

c. Answer is attempted, but is incomplete or incorrect.

1 Point

a. Answer shows the tessellation correctly shaded with three types of shading.

b. Answer is not attempted or is incorrect.

c. Answer is not attempted or is incorrect.

CHAPTER 8 • Quiz 1 — Form A

1. 55 cm^2 **2.** 950 m^2 **3.** 216 m^2 **4.** 252 cm^2

5. 16 ft **6.** 27 in.

7. Sample answer: I took two congruent trapezoids and placed one upside down and next to the other to form a parallelogram. The new parallelogram has an area twice that of each trapezoid. The base of the parallelogram has the same length as the sum of the two bases $\left(b_1 \text{ and } b_2\right)$ of one of the trapezoids. The height of the parallelogram (h) is the same as the height of the trapezoid, so the area of the trapezoid is $\frac{1}{2}\left(b_1 + b_2\right)h$.

CHAPTER 8 • Quiz 1 — Form B

1. 120 cm^2 **2.** 1254 m^2 **3.** 864 m^2

4. 168 cm^2 **5.** 24 ft **6.** 16 cm

7. Sample answer: First, I constructed an altitude from the upper obtuse angle of the parallelogram to the lower base. Then I cut along the altitude to remove the triangle. Then, by moving the triangle to the opposite side of the parallelogram, I got a rectangle with the same area as the original parallelogram. Because the corresponding bases (b) and heights (h) of the two figures are the same length and the area of the rectangle is bh, the parallelogram has an area of bh as well.

CHAPTER 8 • Quiz 2 — Form A

1. 244 cm^2 **2.** 435 ft^2

3. 121π m^2 **4.** 79 cm^2

5. Sample answer: First, I divided the polygon into n triangles radiating from the center of the polygon, where n is the number of sides of the polygon. The altitude of each triangle has the same length as the apothem (a) of the polygon. The area of one triangle is $\frac{1}{2}as$, where s is the length of one side of the polygon. Because there are n triangles, the area of the polygon is $\frac{1}{2}nas$. But ns is just the perimeter p of the polygon. This gives us an area of $\frac{1}{2}ap$.

CHAPTER 8 • Quiz 2 — Form B

1. 976 cm^2 **2.** 261 ft^2 **3.** 196π m^2

4. 177 cm^2

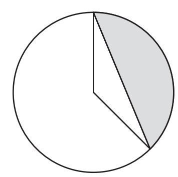
5. Sample answer: First, I cut the circle into several congruent sectors. Then I arranged the sectors in a row, alternating the tips up and down, and formed a figure that looks like a rectangle. The height of the rectangle is approximately the radius of the circle (r), and the length of the base of the rectangle is about half of the circumference of the circle. Therefore, the area of the circle is about $(\pi r)(r)$, or πr^2.

CHAPTER 8 • Quiz 3 — Form A

1. 12π $\text{in}^2 \approx 38$ in^2 **2.** 21π $\text{cm}^2 \approx 66$ cm^2

3. 2776 m^2 **4.** 36π $\text{ft}^2 \approx 113$ ft^2

5. Sample answer: Find the area of the sector formed by connecting the center to the endpoints of the segment. Then subtract the area of the triangle formed by the radii and the segment.



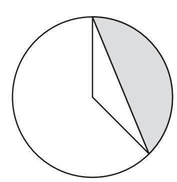
CHAPTER 8 • Quiz 3 — Form B

1. $\frac{243}{4}\pi$ $\text{in}^2 \approx 191$ in^2 **2.** 140π $\text{cm}^2 \approx 440$ cm^2

3. 694 m^2

4. 26.25π ft^2, or $\frac{105}{4}\pi$ $\text{ft}^2 \approx 82$ ft^2

5. Sample answer: Find the area of the sector formed by connecting the center to the endpoints of the segment. Then subtract the area of the triangle formed by the radii and the segment.



CHAPTER 8 • Test   Form A

1. 208 cm^2 **2.** 324π $cm^2 \approx 1018$ cm^2

3. 45 cm   **4.** 40°

5. 392π $cm^2 \approx 1232$ cm^2

6. $(100 - 25\pi)$ $cm^2 \approx 21$ cm^2

7. 20π $cm^2 \approx 63$ cm^2 **8.** 46.5 cm^2

9. $\left(\frac{25}{4}\pi - \frac{25}{2}\right)$ $cm^2 \approx 7$ cm^2

10. 150π $cm^2 \approx 471$ cm^2 **11.** 224 cm^2

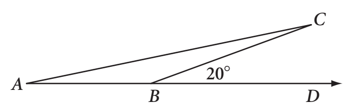
12. Giant   **13.** 8.6 ft   **14.** \$119.85

MIXED REVIEW

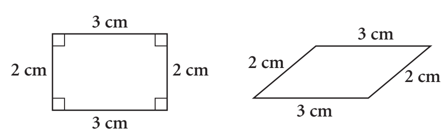
1. $m\angle BAC = 72°$, $m\widehat{BC} = 144°$, $m\widehat{DE} = 108°$, $m\widehat{AB} = 108°$

2. $(x, y) \rightarrow (x + 3, y - 5)$ **3.** $(x, y) \rightarrow (-x, -y)$

4. False. A triangle can have an exterior angle measuring 20°.

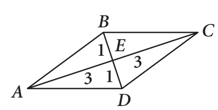


5. False. A rectangle and a non-rectangular parallelogram can have congruent sides but different angle measures.



6. True, by the Triangle Inequality Conjecture.

7. False. In the counterexample, $AE = 3$ cm and $BE = 1$ cm, so they are not equal.



8. Possible answer:

Because $\triangle ABC$ is isosceles with vertex angle C, $\overline{AC} \cong \overline{BC}$. By the Isosceles Triangle Conjecture, $\angle A \cong \angle B$. It is given that $\overline{AD} \cong \overline{BE}$. So, $\triangle ADC \cong \triangle BEC$ by SAS. It follows by CPCTC that $\overline{CD} \cong \overline{CE}$. Therefore, $\triangle DEC$ is isosceles.

CHAPTER 8 • Test   Form B

1. 320 cm^2 **2.** 64π $cm^2 \approx 201$ cm^2

3. 90 cm   **4.** 120°

5. $(392 - 98\pi)$ $cm^2 \approx 84$ cm^2

6. $(400 - 100\pi)$ $cm^2 \approx 86$ cm^2

7. 11π $cm^2 \approx 35$ cm^2 **8.** 48 cm^2

9. $\left(\frac{49}{4}\pi - \frac{49}{2}\right)$ $cm^2 \approx 14$ cm^2

10. 204π $cm^2 \approx 641$ cm^2 **11.** 384 cm^2

12. Regular   **13.** 408.5 cm^2 **14.** \$79.90

MIXED REVIEW

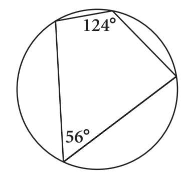
1. $m\angle BAC = 56°$, $m\widehat{BC} = 112°$, $m\widehat{DE} = 124°$, $m\widehat{AB} = 124°$

2. $(x, y) \rightarrow (x - 3, y + 2)$

3. $(x, y) \rightarrow (x, -y)$

4. True. The sum of the exterior angles is 360°, and in a regular polygon the exterior angles are congruent, so each measures $\frac{360°}{18}$, or 20°.

5. False. Opposite angles of this cyclic quadrilateral are supplementary, but no pair of sides is parallel, so it is not a trapezoid.



6. False. By the Triangle Inequality Conjecture, the third side must measure *less* than 35 cm and greater than 5 cm.

7. True, by the Rhombus Diagonals Conjecture.

8. Possible answer:

Because $\triangle ABC$ is isosceles with vertex angle C, $\overline{AC} \cong \overline{BC}$. By the Isosceles Triangle Conjecture, $\angle A \cong \angle B$. It is given that $\angle ACD \cong \angle BCE$. So, $\triangle ADC \cong \triangle BEC$ by ASA. It follows by CPCTC that $\overline{CD} \cong \overline{CE}$. Therefore, $\triangle CDE$ is isosceles.

CHAPTER 8 • Constructive Assessment Options

SCORING RUBRICS

1. 5 Points

Answers are correct. *Note:* The solutions given for parts b–d do not consider areas that might be left unpainted, like windows.

a. TJ: $\frac{\$19.99}{325 \text{ ft}^2} \approx \$0.0615$ per $ft^2 \approx 6¢$ per ft^2;

ABOT: $\frac{\$26.39}{400 \text{ ft}^2} \approx \$0.0660$ per $ft^2 \approx 7¢$ per ft^2;

TJ is cheaper per square foot.

b. 8 gallons of TJ; 6 gallons of ABOT. Work is clear and complete. Possible solution:

First, find the area of the walls. To find the wall area for each room, multiply 7 feet (the height of the ceiling) by the perimeter of the room:

Wall area of bedroom 1:
$7[2(10) + 2(18)] = 392$ ft^2

Wall area of bedroom 2:
$7(10 + 12 + 12 + 4 + 2 + 8) = 336 \text{ ft}^2$

Wall area of living room and hall:
$7(20 + 28 + 14 + 12 + 16 + 6 + 10 + 10) = 812 \text{ ft}^2$

Total wall area: 1540 ft^2

Next, find the area of the ceilings:

Ceiling area of bedroom 1: $10(18) = 180 \text{ ft}^2$

Ceiling area of bedroom 2: $10(12) + 2(4) = 128 \text{ ft}^2$

Ceiling area of living room and hall:
$20(10) + 30(6) + 12(14) = 548 \text{ ft}^2$

Total ceiling area: 856 ft^2

Total area to be painted: 2396 ft^2

To paint this area with TJ paint would require $\frac{2396}{325}$, or 7.37, gallons. Sabrina would need to buy 8 gallons.

To paint this area with ABOT paint would require $\frac{2396}{400}$, or 5.99, gallons. Sabrina would need to buy 6 gallons.

c. TJ: $8 \cdot 19.99 = \$159.92$

ABOT: $6 \cdot 26.39 = \$158.34$

ABOT is cheaper.

d. Explanation is clear and correct. Possible explanation: If Sabrina could pay only for the paint she actually uses, TJ would be cheaper. However, she must buy the paint in whole gallons. With TJ paint, she must buy 8 gallons, even though she needs only 7.37 gallons. With ABOT paint, she must buy 6 gallons, which is almost exactly the amount that she needs. TJ paint is more expensive for the job because Sabrina must pay for more paint than she actually needs.

3 Points
Parts a–c are completed, and methods used are correct. However, two or three minor errors are made in the calculations. Explanation in part d is mostly correct but may be somewhat unclear.

1 Point
Answer to part a is correct. Answers to parts b and c include significant errors. Answer to part d is missing or incorrect.

2. 5 Points
Answers are correct. Explanations are clear and correct.

a. Area of $\triangle AMC = 24$ units^2; area of $\triangle CNA = 24$ units^2; Possible explanation: The altitude from point C to $\overleftrightarrow{AM}$ in $\triangle AMC$ is the same as the altitude from C to $\overleftrightarrow{AB}$ in $\triangle ABC$, but the base length, AM, in $\triangle AMC$ is half the base length, AB, in $\triangle ABC$. Therefore, the area of $\triangle AMC$ is half the area of $\triangle ABC$. A similar argument, using bases $\overline{NC}$ and $\overline{BC}$, shows that the area of $\triangle CNA$ is half the area of $\triangle ABC$.

b. Possible explanation:

area of $\triangle AMP$ = area of $\triangle AMC$ − area of $\triangle APC$

area of $\triangle CNP$ = area of $\triangle CNA$ − area of $\triangle APC$

Because the areas of $\triangle AMC$ and $\triangle CNA$ are equal (see part a) and because the same quantity, the area of $\triangle APC$, is being subtracted from both, the differences must be equal. That is, area of $\triangle AMP$ = area of $\triangle CNP$.

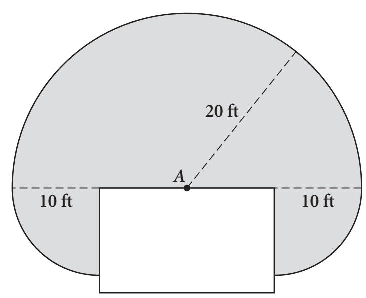
c. $\frac{1}{6}$; Possible explanation: If you construct the third median, $\overline{BO}$, which will also pass through P, then you can use the same reasoning used in part b to show that $\triangle COP$, $\triangle CNP$, $\triangle BNP$, $\triangle BMP$, $\triangle AMP$, and $\triangle AOP$ all have the same area. Therefore, each must have area equal to $\frac{1}{6}$ the area of $\triangle ABC$.

3 Points
Answers are mostly correct but may contain calculation errors. Explanations are essentially correct but may be somewhat unclear.

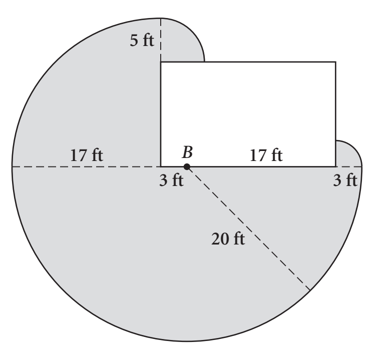
1 Point
Answers and explanation are attempted but are incomplete or incorrect.

3. 5 Points
Answers are correct. Sketches are clearly labeled. All work is shown.

a. Point A:
$$\text{area} = \frac{1}{2}\pi(20)^2 + \frac{1}{4}\pi(10)^2 + \frac{1}{4}\pi(10)^2 = 250\pi \text{ ft}^2 \approx 785 \text{ ft}^2$$



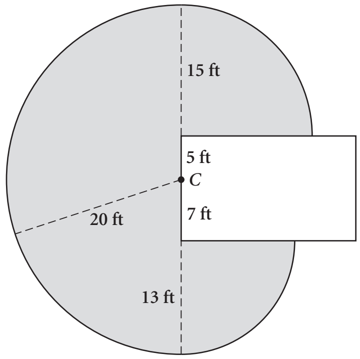
Point B:
$$\text{area} = \frac{1}{2}\pi(20)^2 + \frac{1}{4}\pi(17)^2 + \frac{1}{4}\pi(5)^2 + \frac{1}{4}\pi(3)^2 = 280.75\pi \text{ ft}^2 \approx 882 \text{ ft}^2$$



Point C:

area $= \frac{1}{2}\pi(20)^2 + \frac{1}{4}\pi(15)^2 + \frac{1}{4}\pi(13)^2$

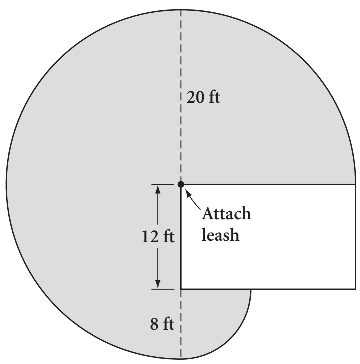
$= 298.5\pi \text{ ft}^2 \approx 938 \text{ ft}^2$



b. To give Spot the maximum area, the leash should be attached at one of the corners of the shed.

maximum area $= \frac{3}{4}\pi(20)^2 + \frac{1}{4}\pi(8)^2$

$= 316\pi \text{ ft}^2 \approx 993 \text{ ft}^2$



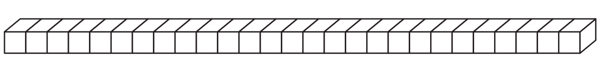
3 Points
Two of the three answers and sketches for part a are correct. The answer and sketch for part b are correct.

1 Point
Only one answer and sketch for part a is correct. The answer for part b is incorrect or missing.

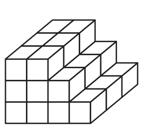
4. 5 Points
All answers are correct. All sketches and descriptions are clear.

a. $27(6) = 162 \text{ cm}^2$

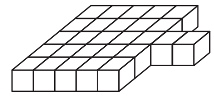
b. $4(27) + 2 = 110 \text{ cm}^2$



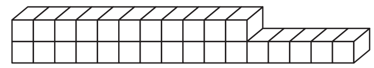
c. $9 + 9 + 9 + 12 + 6 + 3 + 3 + 3 + 3 + 3 = 60 \text{ cm}^2$



d. Answers will vary. Arrangement must have a surface area of 78 cm^2. Possible answer:



e. Answers will vary. Arrangement must have a surface area of 90 cm^2. Possible answer:



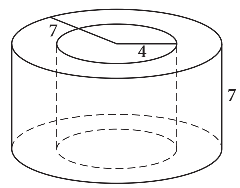
f. The largest surface area is 162 cm^2, which is the surface area of 27 separate cubes. The smallest surface area is 54 cm^2, which is the surface area of a 3-by-3-by-3 cube.

3 Points
Answers to parts a, b, and f are correct. Parts d and e are attempted but are not correct.

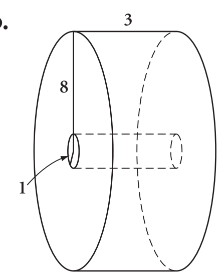
1 Point
Answers to parts a and b are correct. Remaining answers are missing or are incorrect.

5. 5 Points
Answers are correct. Sketches are clear, and inner and outer radii and height are labeled.

a.



b.



c. Predictions will vary. 220π units^2 and 180π units^2. All work is shown.

Solid from part a: area of bases $= 2(\pi R^2 - \pi r^2) = 2[\pi(7)^2 - \pi(4)^2] = 66\pi$ units^2; area of outside lateral surface $= 2\pi Rh = 2\pi(7)(7) = 98\pi$ units^2; area of inside lateral surface $= 2\pi rh = 2\pi(4)(7) = 56\pi$ units^2; total surface area $= 66\pi + 98\pi + 56\pi = 220\pi$ units^2

Solid from part b: area of bases $= 2(\pi R^2 - \pi r^2) = 2[\pi(8)^2 - \pi(1)^2] = 126\pi$ units^2; area of outside lateral surface $= 2\pi Rh = 2\pi(8)(3) = 48\pi$ units^2; area of inside lateral surface $= 2\pi rh = 2\pi(1)(3) = 6\pi$ units^2; total surface area $= 126\pi + 48\pi + 6\pi = 180\pi$ units^2

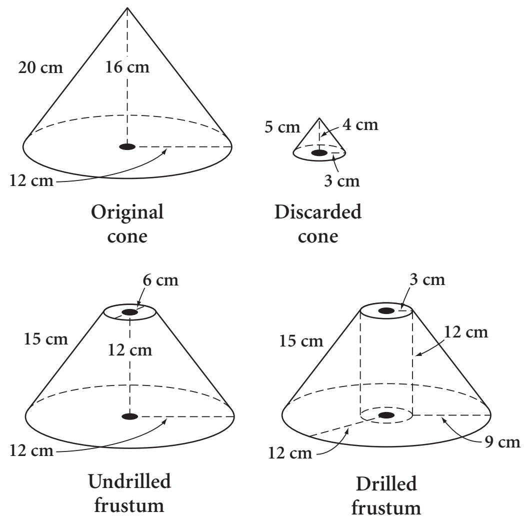
The surface area of the solid in part a is greater.

3 Points
Sketches are correct. Prediction is made. Correct method is used to calculate the surface areas, but some errors are made in the calculations.

1 Point
Sketches are unclear or several measurements are missing. Prediction is made. Surface area computations are attempted but include significant errors.

6. 5 Points
Answers are correct. Steps are clear, correct, and easy to follow.

a.



b. 432π cm^2; Possible solution: The total painted area equals the sum of the lateral surface area of the frustum, the lateral surface area of the inner cylinder, and the area of the base. I will find these areas separately and then add them.

The lateral surface area of the frustum is the lateral surface area of the original cone minus the lateral surface area of the discarded cone.

- Lateral surface area of original cone $= \pi rl = \pi(12)(20) = 240\pi$ cm^2
- Lateral surface area of discarded cone $= \pi rl = \pi(3)(5) = 15\pi$ cm^2
- Lateral surface area of frustum $= 240\pi - 15\pi = 225\pi$ cm^2

Now I'll find the area of the other surfaces.

- Lateral area of inner cylinder $= 2\pi rh = 2\pi(3)(12) = 72\pi$ cm^2
- Area of base (annulus) $= \pi R^2 - \pi r^2 = \pi(12)^2 - \pi(3)^2 = 144\pi - 9\pi = 135\pi$ cm^2
- Total painted surface area $= 225\pi + 72\pi + 135\pi = 432\pi$ cm^2

3 Points
Sketches are correct. A reasonable procedure is attempted in part b, but the answer is incorrect due to calculation errors.

1 Point
Sketches are mostly correct (some measurements may be missing). Part b is attempted, but the procedure is unclear or incorrect.

CHAPTER 9 • Quiz 1 — Form A

1. $\sqrt{95}$ cm $\approx$ 9.7 cm
2. No
3. 34 m
4. 216 in^2
5. 17 ft

CHAPTER 9 • Quiz 1 — Form B

1. $\sqrt{85}$ cm $\approx$ 9.2 cm
2. No
3. 51 m
4. 150 in^2
5. 13 ft

CHAPTER 9 • Quiz 2 — Form A

1. $6\sqrt{2}$ cm $\approx$ 8.5 cm
2. $r = 20\sqrt{3}$ cm $\approx$ 34.6 cm, $s = 20$ cm
3. $16\sqrt{3}$ in^2 $\approx$ 27.7 in^2
4. 25 ft
5. 48 cm^2

CHAPTER 9 • Quiz 2 — Form B

1. $8\sqrt{2}$ cm $\approx$ 11.3 cm
2. $r = 12\sqrt{3}$ cm $\approx$ 20.8 cm, $s = 12$ cm
3. $9\sqrt{3}$ in^2 $\approx$ 15.6 in^2
4. 50 ft
5. 60 cm^2

CHAPTER 9 • Quiz 3 — Form A

1. $2\sqrt{2}$ units
2. 20π units
3. 64 mi
4. $(6\pi - 9\sqrt{3})$ cm^2 $\approx$ 3.3 cm^2

CHAPTER 9 • Quiz 3 — Form B

1. $3\sqrt{5}$ units
2. 26π units
3. 70 mi
4. $(24\pi - 36\sqrt{3})$ cm^2 $\approx$ 13.0 cm^2

CHAPTER 9 • Test — Form A

Part A

1. hypotenuse
2. $x^2 + y^2 = z^2$
3. $x\sqrt{2}$
4. $\frac{y}{2}; \frac{y}{2}\sqrt{3}$

Part B

1. 24 cm
2. No
3. 26 cm
4. 170 ft
5. 36 m
6. $15\sqrt{2}$ cm $\approx$ 21.2 cm

7. Isosceles **8.** 2040 km

9. $9\sqrt{3}$ m$^2 \approx 15.6$ m^2 **10.** $10\pi\sqrt{2}$ in. ≈ 44.4 in.

11. 5 units **12.** 12π cm$^2 \approx 37.7$ cm^2

Part C

According to the Pythagorean Theorem, $a^2 + b^2 = c^2$, where a and b are the lengths of the legs and c is the length of the hypotenuse.

$x^2 + x^2 = c^2$	Substitute x for a and b.
$2x^2 = c^2$	Combine like terms.
$\sqrt{2x^2} = c$	Take the square root of both sides.
$x\sqrt{2} = c$	Simplify the radical.

Mixed review

1. 108π cm$^2 \approx 339$ cm^2 **2.** 8.4 cm^2

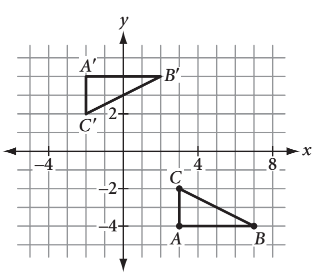
3. $EF = \frac{5\sqrt{3}}{2}$ cm, or about 4.3 cm. Possible explanation: $\angle C$ is a right angle because it is inscribed in a semicircle, so $\triangle CDF$ is a right triangle. $AD = AF = 5$ cm, because both are radii, so use the Pythagorean Theorem to find FC. $(FC)^2 = 10^2 - 5^2$, so $FC = 5\sqrt{3}$. Because a radius that is perpendicular to a chord bisects that chord, $\overline{AB}$ bisects $\overline{FC}$, so $EF = \frac{1}{2}FC$, or $\frac{5\sqrt{3}}{2}$ cm.

4. $AE = 2.5$ cm; $\angle FEA$ is a right angle because it forms a linear pair with right angle $\angle FEB$. So, $\triangle FEA$ is a right triangle. Use the Pythagorean Theorem: $(AE)^2 + \left(\frac{5\sqrt{3}}{2}\right)^2 = 5^2$. Solve to get $AE = 2.5$ cm.

5. $m\angle CFD = 30°$; Draw $\overline{AC}$ to form equilateral triangle ACD. Equilateral triangles are equiangular, so $m\angle FDC = 60°$. Using $\triangle FDC$ and $m\angle FCD = 90°$, $m\angle CFD = 180° - 90° - 60° = 30°$.

6. $m\widehat{FC} = 120°$; The measure of an inscribed angle is half the measure of its intercepted arc, so $m\angle FDC = \frac{1}{2}m\widehat{FC}$. Because $m\angle FDC = 60°$, $m\widehat{FC} = 120°$.

7.



8. (1, 4); the centroid

CHAPTER 9 • Test Form B

Part A

1. z **2.** legs **3.** $r^2 + s^2 = t^2$

4. $p\sqrt{3}$, $2p$

Part B

1. 52 cm **2.** No **3.** 39 cm

4. 250 ft **5.** Isosceles

6. $13\sqrt{2}$ cm ≈ 18.4 cm

7. 225 mi **8.** $16\sqrt{3}$ ft$^2 \approx 27.7$ ft^2

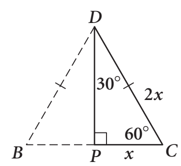
9. $\frac{32}{\sqrt{3}}$ m, or $\frac{32\sqrt{3}}{3}$ m ≈ 18.5 m

10. 8π m ≈ 25.1 m

11. 5 units **12.** $\left(\frac{9\pi}{2} - 9\right)$ cm$^2 \approx 5.1$ cm^2

Part C

Draw an altitude to point P on base $\overline{BC}$. Because $\triangle DBC$ is equilateral and therefore isosceles, the altitude is also a median and an angle bisector. So, $PC = \frac{1}{2}BC = x$, and $m\angle CDP = \frac{1}{2}m\angle BDC = 30°$. $\triangle DPC$ is a 30°-60°-90° triangle.



According to the Pythagorean Theorem, $a^2 + b^2 = c^2$, where a and b are the lengths of the legs and c is the length of the hypotenuse.

$x^2 + (DP)^2 = (2x)^2$	Substitute the values for $\triangle DPC$.
$(DP)^2 = (2x)^2 - x^2$	Subtract x^2 from both sides.
$(DP)^2 = 4x^2 - x^2$	Multiply.
$(DP)^2 = 3x^2$	Combine like terms.
$DP = x\sqrt{3}$	Take the positive square root of both sides.

Thus the length of the short leg is x, the length of the longer leg is $x\sqrt{3}$, and the length of the hypotenuse is $2x$.

Mixed review

1. 48π cm$^2 \approx 151$ cm^2

2. 32.1 cm^2

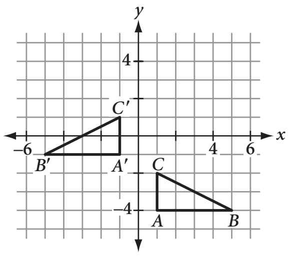
3. $EF = \frac{3\sqrt{3}}{2}$ cm, or about 2.6 cm. Possible explanation: $\angle C$ is a right angle because it is inscribed in a semicircle, so $\triangle CDF$ is a right triangle. $AD = AF = 3$ cm, because both are radii, so use the Pythagorean Theorem to find FC. $(FC)^2 = 6^2 - 3^2$, so $FC = 3\sqrt{3}$. Because a radius that is perpendicular to a chord bisects that chord, $\overline{AB}$ bisects $\overline{FC}$, so $EF = \frac{1}{2}FC$, or $\frac{3\sqrt{3}}{2}$ cm.

4. $AE = 1.5$ cm; $\angle FEA$ is a right angle because it forms a linear pair with right angle $\angle FEB$. So, $\triangle FEA$ is a right triangle. Use the Pythagorean Theorem: $(AE)^2 + \left(\frac{3\sqrt{3}}{2}\right)^2 = 3^2$. Solve to get $AE = 1.5$ cm.

5. $m\angle CFD = 30°$; Draw $\overline{AC}$ to form equilateral triangle ACD. Equilateral triangles are equiangular, so $m\angle FDC = 60°$. Using $\triangle FDC$ and $m\angle FCD = 90°$, $m\angle CFD = 180° - 90° - 60° = 30°$.

6. $m\widehat{FC} = 120°$; The measure of an inscribed angle is half the measure of its intercepted arc, so $m\angle FDC = \frac{1}{2}m\widehat{FC}$. Because $m\angle FDC = 60°$, $m\widehat{FC} = 120°$.

7.



8. (2, 4); the centroid

CHAPTER 9 • Constructive Assessment Options

Scoring rubrics

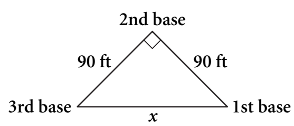
1. 5 Points
Answers are correct. Work is shown. Diagrams are clearly labeled.

a. $x^2 = 90^2 + 90^2$

$x^2 = 16{,}200$

$x = \sqrt{16{,}200}$

$x \approx 127.28$



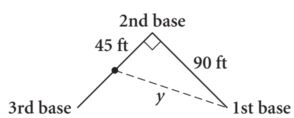
A throw from 3rd base to 1st base is about 127.28 feet.

b. $y^2 = 45^2 + 90^2$

$y^2 = 10{,}125$

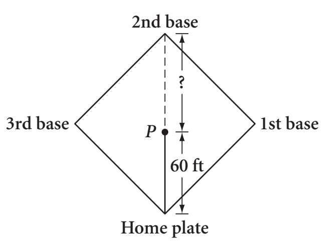
$y = \sqrt{10{,}125}$

$y \approx 100.62$



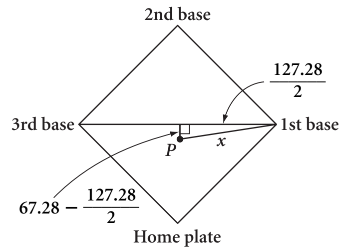
The throw is about 100.62 feet.

c. The diagram below shows that the distance from the pitcher's mound to 2nd base equals the distance from home plate to 2nd base minus 60 ft.



The distance from home plate to 2nd base is the same as the distance from 1st base to 3rd base, which is about 127.28 ft (see part a). So, the distance from the pitcher's mound to 2nd base is 127.28 − 60, or about 67.28 ft.

The diagram below shows the right triangle needed to find the distance from the pitcher's mound to 1st base.



The length of the horizontal leg of the triangle is $\frac{127.28}{2}$ ft, half the distance from 1st base to 3rd base. The length of the vertical leg is the distance from the pitcher's mound to 2nd base, 67.28 ft, minus half the distance from home plate to 2nd base, $\frac{127.28}{2}$ ft. Using the Pythagorean theorem,

$$x^2 = \left(67.28 - \frac{127.28}{2}\right)^2 + \left(\frac{127.28}{2}\right)^2$$

$$x = \sqrt{\left(67.28 - \frac{127.28}{2}\right)^2 + \left(\frac{127.28}{2}\right)^2} \approx 63.74$$

The distance from the pitcher's mound to 1st base is about 63.74 feet. The distance from the pitcher's mound to 3rd base is also about 63.74 feet. (If intermediate answers are stored and used unrounded, the distance is about 63.70 feet.)

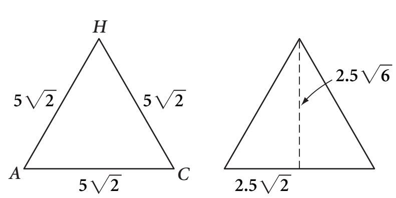
3 Points
Answers and diagrams for parts a and b are correct. A reasonable attempt is made to answer part c, but two of the three distances are incorrect.

1 Point
Parts a and b are both attempted, but only one of the answers is correct. Part c is attempted, but all the distances are incorrect.

2. 5 Points
Answers and explanations are clear and correct.

a. Area $= 25\sqrt{2}$ cm², or about 35.4 cm²; Possible explanation: The area of $ADGF$ equals $AD \cdot DG$. $\overline{AD}$ is an edge of the cube, so $AD = 5$ cm. $\overline{DG}$ is the hypotenuse of an isosceles right triangle with leg length 5 cm, so $DG = 5\sqrt{2}$ cm. So, area of $ADGF = 5 \cdot 5\sqrt{2} = 25\sqrt{2} \approx 35.4$ cm².

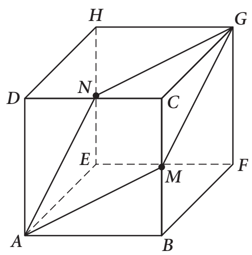
b. Area $= 12.5\sqrt{3}$ cm², or about 21.7 cm²; Possible explanation: Each side of $\triangle ACH$ is a diagonal of one of the faces of the cube. So, $\triangle ACH$ is an equilateral triangle with side length $5\sqrt{2}$.



If you draw an altitude of the triangle, you get two 30°-60°-90° triangles. The shorter leg has length $\frac{1}{2}(5\sqrt{2}) = 2.5\sqrt{2}$, so the longer leg has length $2.5\sqrt{2}(\sqrt{3}) = 2.5\sqrt{6}$. Therefore,

$$\text{area of } \triangle ACH = \frac{1}{2}(5\sqrt{2})(2.5\sqrt{6})$$
$$= 6.25\sqrt{12} = 12.5\sqrt{3} \approx 21.7 \text{ cm}^2$$

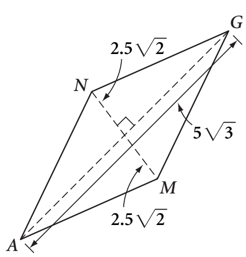
c. *AMGN* is a rhombus.



Area of $AMGN = 12.5\sqrt{6}$ cm^2, or about 30.6 cm^2; Possible explanation: Diagonal $\overline{AG}$ of rhombus *AMGN* is the hypotenuse of right $\triangle AFG$. Leg $\overline{AF}$ is a diagonal of one of the cube's faces, so $AF = 5\sqrt{2}$. Leg $\overline{FG}$ is an edge of the cube, so $FG = 5$. By the Pythagorean theorem,

$$AG = \sqrt{(5\sqrt{2})^2 + 5^2} = \sqrt{75} = 5\sqrt{3}$$

Diagonal $\overline{NM}$ of rhombus *AMGN* is the diagonal of a cross section parallel to square *ABFE*. The cross section is a square of side length 5, so $NM = 5\sqrt{2}$.



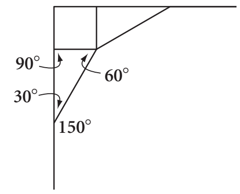
$$\text{Area of } AMGN = \text{area of } \triangle AGN + \text{area of } \triangle AGM$$
$$= \frac{1}{2}(2.5\sqrt{2})(5\sqrt{3})$$
$$+ \frac{1}{2}(2.5\sqrt{2})(5\sqrt{3})$$
$$= 12.5\sqrt{6} \text{ cm}^2$$

3 Points
Answers to two of the three parts are correct.

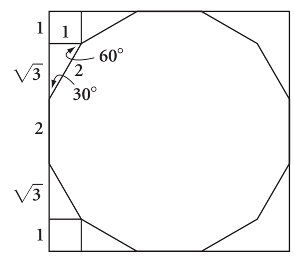
1 Point
Answer to one of the three parts is correct.

3. 5 Points
Answers, sketches, and explanations are clear and correct.

a. 30°, 60°, 90°; Possible explanation: The largest angle of the triangle and an angle of the small square are a linear pair, so the largest angle measures 90°. The measure of each angle of the dodecagon is $\frac{10(180°)}{12}$, or 150°. Because an angle of the dodecagon and the smallest angle of the triangle are a linear pair, the smallest angle measures 30°. Because the sum of the angle measures of a triangle equals 180°, the third angle must measure 180° − (90° + 30°), or 60°.



b. $28 + 16\sqrt{3}$ cm^2; Possible explanation: Using the 30°-60°-90° Triangle Conjecture, the shorter leg of one of the right triangles has length 1 cm, and the longer leg has length $\sqrt{3}$ cm. Because the shorter leg is a side of a small square, the side length of a small square is also 1 cm. The diagram below shows that the side length of the large square is $1 + \sqrt{3} + 2 + \sqrt{3} + 1 = 4 + 2\sqrt{3}$ cm. Therefore, the area of the square is $(4 + 2\sqrt{3})^2 = 16 + 8\sqrt{3} + 8\sqrt{3} + 12 = 28 + 16\sqrt{3}$ cm^2.



c. $24 + 12\sqrt{3}$ cm^2; Possible explanation: The area of the dodecagon is equal to the area of the large square minus the area of 8 small triangles and 4 small squares. So,

$$\text{Area of dodecagon}$$
$$= 28 + 16\sqrt{3} - 8\left(\frac{1}{2} \cdot 1 \cdot \sqrt{3}\right) - 4(1)$$
$$= 28 + 16\sqrt{3} - 4\sqrt{3} - 4$$
$$= 24 + 12\sqrt{3} \text{ cm}^2$$

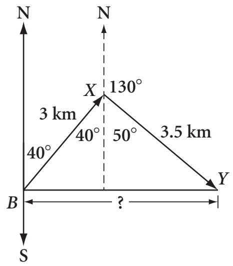
3 Points
The angle measures, sketch, and explanation in part a are correct and complete. Correct procedures were used to answers parts b and c, but one or both answers are incorrect due to computation errors.

1 Point
The answer to part a is correct and complete.
The answers to parts b and c are incorrect, and the explanations indicate that an incorrect procedure was used.

4. 5 Points

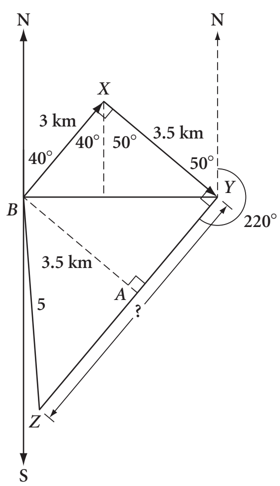
The campers are within radio range. Explanation and sketch are clear, complete, and correct.

a. Possible solution: In the diagram, B is base camp and Y is the point where the hikers stopped.



The "North" line through X divides $\angle BXY$ into two angles. The angle on the left measures 40° by the AIA Conjecture, and the angle on the right measures 50° by the Linear Pair Conjecture. Thus, $\angle BXY$ is a right angle. Because $\triangle BXY$ is a right triangle, you can use the Pythagorean Theorem to find BY, the distance from base camp. $BY = \sqrt{3^2 + 3.5^2} = \sqrt{21.25} \approx 4.61$ km. The campers are less than 5 km from base camp, so they are within radio range.

b. Possible solution: In the diagram, YZ is the distance the campers must walk to be *exactly* 5 km from base camp, B. Perpendicular $\overline{BA}$ has been drawn from B to $\overline{YZ}$.



Because $\overleftrightarrow{BA} \parallel \overleftrightarrow{XY}$, $AY = 3$ km. Using the Pythagorean Theorem, $(ZA)^2 = (BZ)^2 - (BA)^2$. $BZ = 5$ km, and because $BAYX$ is a parallelogram, $BA = 3.5$ km. Therefore, $ZA = \sqrt{5^2 - 3.5^2} \approx 3.57$ km. So, $YZ \approx 3 + 3.57 \approx 6.57$ km. The campers can walk 6.57 km and still be within radio range of base camp.

3 Points

a. Sketch is correct. Answer states that campers are within radio range. Explanation is clear, complete, and correct.

b. The sketch is correct, but an error is made in finding the answer.

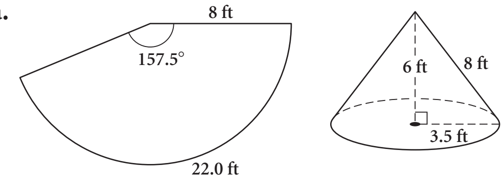
1 Point

a. Sketch is correct. Answer states that campers *are* within radio range. Explanation is essentially correct, although it may be somewhat unclear.

b. Sketch is attempted, but is incomplete or incorrect. Answer is incorrect.

5. 5 Points

a.



b. No. Possible explanation: The lengths 3.5, 6, and 8 do not satisfy the Pythagorean Theorem, so the angle formed by the pole and the ground cannot be a right angle.

c. For the cover to fit, the radius of the base of the cone needs to be about 5.3 ft $\left(\sqrt{8^2 - 6^2}\right)$. The base circumference, which is also the arc length of the sector, would then be $2\pi(5.3)$, or about 33.3 ft. Therefore,

$$\frac{33.3}{16\pi} = \frac{\text{central angle measure}}{360°}$$

$$\text{central angle measure} = \frac{33.3}{16\pi}(360°)$$

The central angle measure would need to be 238.5° (or 238.1° if intermediate answers are used unrounded). The height of the tent will be 6 ft and the base radius will be 5.3 ft.

3 Points

The answers to parts a and b are complete and correct. In part c, the new radius is found but not the change in the central angle.

1 Point

Part a is complete and correct. The other parts are incorrect, and the work includes significant errors.

6. 5 Points

Radius is given as $\sqrt{80}$, or $4\sqrt{5}$, units. Steps are correct, complete, and clearly stated.

Possible answer: The slope of the tangent line is $\frac{1}{2}$, so the slope of the radius to the tangent is -2. The line containing that radius has slope -2 and passes through (1, 7), so its equation is $y - 7 = -2(x - 1)$, or $y = -2x + 9$. Solving the system

$$\begin{cases} y = \frac{1}{2}x - \frac{7}{2} \\ y = -2x + 9 \end{cases}$$

yields the point of tangency, which is $(5, -1)$. The radius of the circle is the distance from the center, (1, 7), to the point of tangency, $(5, -1)$. This distance is $\sqrt{(5 - 1)^2 + (-1 - 7)^2} = \sqrt{80} = 4\sqrt{5}$. The radius of the circle is $4\sqrt{5}$ units.

3 Points
The steps indicate that the correct procedure was used, but the radius is incorrect due to calculation errors.

1 Point
Radius is incorrect. The first step or two are correct, but the solution includes significant errors.

CHAPTERS 7–9 • Exam — Form A

Part A

1. translation **2.** $\sqrt{97}$ units

3. $\langle 3, -9 \rangle$ **4.** 4 cm

5. 12π ft^2 **6.** squares

7. 81π cm^2

8. $\frac{x}{\sqrt{3}}\left(\text{or } \frac{x\sqrt{3}}{3}\right); \frac{2x}{\sqrt{3}}\left(\text{or } \frac{2x\sqrt{3}}{3}\right)$

9. perpendicular bisector **10.** 98 cm^2

11. $(0, -4)$; 3 units **12.** $(x, -y)$

13. $m^2 + n^2 = p^2$ **14.** 150 in^2

15. translation

Part B

1. Answers will vary. **2.** Answers will vary.

3. 4.6.12

4. No; the side lengths do not work in the Pythagorean formula (that is, $5^2 + 7^2 \neq 9^2$).

5. Isosceles; $LM = MN = \sqrt{20}$, while $LN = \sqrt{40}$.

Part C

1. 6 cm^2 **2.** 2400 cm^2 **3.** 180 in^2

4. $(18\pi - 36)$ cm$^2 \approx 20.5$ cm^2

5. 7 cm **6.** 170π ft$^2 \approx 534$ ft^2

7. $36\sqrt{3}$ cm$^2 \approx 62.4$ cm^2 **8.** 6 in. **9.** 9 m

10. $(144\sqrt{3} - 72\pi)$ cm$^2 \approx 23.2$ cm^2

CHAPTERS 7–9 • Exam — Form B

Part A

1. rotation **2.** $\frac{h}{2}; \frac{h}{2}\sqrt{3}$

3. $\sqrt{578}$ units **4.** $\langle -5, 0 \rangle$

5. 4 cm **6.** hexagons

7. 81π cm^2 **8.** translation

9. 72 cm^2 **10.** $(-7, 0)$; 4 units

11. $(-x, y)$ **12.** 8π ft^2

13. $f^2 + g^2 = h^2$ **14.** perpendicular bisector

15. 216 in^2

Part B

1. Answers will vary. **2.** Answers will vary.

3. 3.4.6.4

4. No; the side lengths do not work in the Pythagorean formula (that is, $6^2 + 13^2 \neq 14^2$).

5. Scalene; $LM = \sqrt{17}$, $MN = \sqrt{20}$, and $LN = \sqrt{29}$.

Part C

1. 24 cm^2 **2.** 600 cm^2 **3.** 180 in^2

4. $(32\pi - 64)$ cm$^2 \approx 36.5$ cm^2

5. 6 cm **6.** 84π ft$^2 \approx 264$ ft^2

7. $81\sqrt{3}$ cm$^2 \approx 140$ cm^2 **8.** 8 in.

9. 10 m

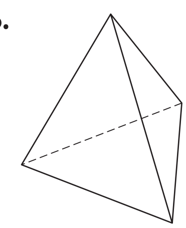
10. $(64\sqrt{3} - 32\pi)$ cm$^2 \approx 10.3$ cm^2

CHAPTER 10 • Quiz 1 — Form A

1. 240 cm^3 **2.** 90π in$^3 \approx 283$ in^3

3. 5280 cm^3 **4.** 8 ft

5. 216π cm$^3 \approx 679$ cm^3 **6.**

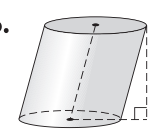


CHAPTER 10 • Quiz 1 — Form B

1. 30 cm^3 **2.** 168π in$^3 \approx 528$ in^3 **3.** 4840 cm^3

4. 5 ft **5.** 343π cm$^3 \approx 1078$ cm^3

6.



CHAPTER 10 • Quiz 2 — Form A

1. 1152 m^3 **2.** 1260π in$^3 \approx 3958$ in^3

3. 7 cm **4.** 2.778 g/cm^3

CHAPTER 10 • Quiz 2 — Form B

1. 1700 m^3 **2.** 540π in$^3 \approx 1696$ in^3

3. 9 cm **4.** 2.708 g/cm^3

CHAPTER 10 • Quiz 3 — Form A

1. 4500π yd$^3 \approx 14{,}137$ yd^3; 900π yd$^2 \approx 2827$ yd^2

2. 256π in$^3 \approx 804$ in^3 **3.** 12 cm **4.** 31.5 in.

CHAPTER 10 • Quiz 3 — Form B

1. 972π yd$^3 \approx 3054$ yd^3; 324π yd$^2 \approx 1018$ yd^2

2. 864π in$^3 \approx 2714$ in^3 **3.** 30 cm **4.** 36 in.

CHAPTER 10 • Test — Form A

Part A

1. lateral edges **2.** sphere

3. perpendicular; vertex **4.** mass; volume

Part B

1. 7125 cm^3 **2.** 1024 cm^3

3. 2356 cm^3

Part C

1. 9.3 cm **2.** 16 cm

3. 7 cm **4.** 180π in$^3 \approx 565$ in^3

5. 6 cm **6.** About 84 g

Part D

1. 2250π cm$^3 \approx 7069$ cm^3; 675π cm$^2 \approx 2121$ cm^2

2. 196π cm$^3 \approx 616$ cm^3

3. No; the volume of the cone ($\approx 20.83\pi$ cm^3) is less than the volume of the ice cream (36π cm^3).

Mixed review

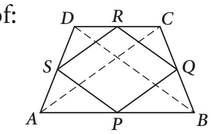
1. 96 cm^2 **2.** See table below

3. $BC = 16$ cm, $BD = 8\sqrt{3}$ cm, $DE = 12$ cm, $EF = 6\sqrt{3}$ cm, $FG = 9$ cm

4. $\frac{9}{\sqrt{3}} = 3\sqrt{3}$ cm$^2 \approx 5.2$ cm^2

5. 12; Possible explanation: The three angles must sum to 360°. The triangle angle is 60°, so the other two angles must sum to 300°. The two polygons are congruent, so the interior angle of one of the polygons must be 150°. The measure of each interior angle of a regular polygon is given by the formula $\frac{180°(n-2)}{n}$, where n is the number of sides. Solve $\frac{180°(n-2)}{n} = 150°$ to get $n = 12$.

6. Possible proof:



Construct diagonals $\overline{AC}$ and $\overline{BD}$. By the Isosceles Trapezoid Diagonals Conjecture, $\overline{AC} \cong \overline{BD}$, so $AC = BD$. By the definition of midsegment, $\overline{PQ}$ is a midsegment of $\triangle ABC$, so by the Triangle Midsegment Conjecture, $PQ = \frac{1}{2}AC$. Using the same reasoning, $RS = \frac{1}{2}AC$, $RQ = \frac{1}{2}DB$, and $PS = \frac{1}{2}DB$. Because $AC = DB$, $\frac{1}{2}AC = \frac{1}{2}DB$, so $PQ = RS = RQ = PS$. Therefore, all four sides of $PQRS$ are congruent and $PQRS$ is a rhombus.

CHAPTER 10 • Test — Form B

Part A

1. right **2.** tetrahedron

3. $\frac{4}{3}\pi^3$ **4.** lateral faces

Part B

1. 252 cm^3 **2.** 3120 cm^3 **3.** 184 cm^3

Part C

1. 18.9 cm **2.** 21 cm **3.** 0.94 g/cm^3

4. 6 cm **5.** About 338 g **6.** 1403 cm^3

Part D

1. 3888π cm$^3 \approx 12{,}215$ cm^3; 972π cm$^2 \approx 3054$ cm^2

2. 183.75π cm$^3 \approx 577$ cm^3

3. No; the volume of the cone $(\approx 18.75\pi$ cm$^3)$ is less than the volume of the ice cream $(36\pi$ cm$^3)$.

Mixed review

1. 360 cm^2 **2.** See table below

3. $BC = 36$ cm, $BD = 18\sqrt{3}$ cm, $DE = 27$ cm, $EF = 13.5\sqrt{3}$ cm, $FG = 20.25$ cm

4. $\frac{16}{\sqrt{3}} = \frac{16\sqrt{3}}{3}$ cm$^2 \approx 9.2$ cm^2

Chapter 10 Test, Form A, Mixed Review, Problem 2

2.

n	1	2	3	4	5	6	. . .	n	. . .	200
$f(n)$	41	38.5	36	33.5	**31**	**28.5**		$-2.5n + 43.5$		-456.5

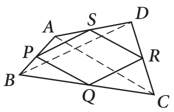
Chapter 10 Test, Form B, Mixed Review, Problem 2

2.

n	1	2	3	4	5	6	. . .	n	. . .	200
$f(n)$	27	25.5	24	22.5	**21**	**19.5**		$-1.5n + 28.5$		-271.5

5. 15; Possible explanation: The three angles must sum to 360°. The triangle angle is 60°. The decagon angle can be found by using the formula $\frac{180°(n-2)}{n}$, where n is the number of sides. $\frac{180°(10-2)}{10} = 144°$. Add the two angles and subtract from 360° to find the third angle: $360° - (60° + 144°) = 156°$. Then solve $\frac{180°(n-2)}{n} = 156°$ to get $n = 15$.

6.



Possible proof: Construct diagonals $\overline{AC}$ and $\overline{BD}$. By the definition of midsegment, $\overline{PQ}$ is a midsegment of $\triangle ABC$, so by the Triangle Midsegment Conjecture, $\overline{PQ} \parallel \overline{AC}$. Similarly, $\overline{SR}$ is a midsegment of $\triangle ADC$, so $\overline{SR} \parallel \overline{AC}$. Because both segments are parallel to the same segment, they are parallel to each other, so $\overline{SR} \parallel \overline{PQ}$. $\overline{PS}$ is a midsegment of $\triangle ABD$, and $\overline{QR}$ is a midsegment of $\triangle CBD$, so using the same reasoning, both segments are parallel to $\overline{DB}$ and are parallel to each other. Thus both pairs of opposite sides of $PQRS$ are parallel and $PQRS$ is a parallelogram.

CHAPTER 10 • Constructive Assessment Options

SCORING RUBRICS

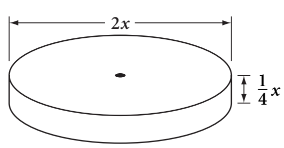
1. 5 Points

Answers are complete and correct.

a. $V = \pi\left(\frac{1}{2}x\right)^2 x = \frac{1}{4}\pi x^3$;

$$SA = 2\left[\pi\left(\frac{x}{2}\right)^2\right] + \pi x \cdot x = \frac{1}{2}\pi x^2 + \pi x^2$$
$$= \frac{3}{2}\pi x^2$$

b. Answers will vary. Sketch should show a cylinder with volume $\frac{1}{4}\pi x^3$. Possible answer:



$$V = \pi x^2 \cdot \frac{1}{4}x = \frac{1}{4}\pi x^3$$

c. Answers will vary, depending on the can drawn in part b. Surface area of can above: $SA = 2(\pi x^2) + (2\pi x)\left(\frac{1}{4}x\right) = \frac{5}{2}\pi x^2$

d. The square can has less surface area.

3 Points

Parts a and b are correct. Computation errors lead to an incorrect answer for part c.

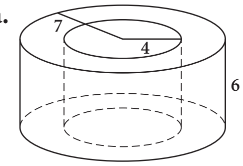
1 Point

The answers to part a are correct, but the can in b does not have the correct volume.

2. 5 Points

Answers are correct. Work is clear and easy to follow.

a.



$$V = \pi\left(7^2\right)(6) - \pi\left(4^2\right)(6)$$
$$= 198\pi \text{ units}^3 \approx 622.04 \text{ units}^3$$

b. $\left(\frac{4+7}{2}, \frac{8+2}{2}\right) = \left(\frac{11}{2}, 5\right)$

c. $C = 2\pi\left(\frac{11}{2}\right) = 11\pi$ units, or about 34.56 units

d. $11\pi \cdot 18 = 198\pi$ units^3, or about 622.04 units^3; The result is the same as the volume.

3 Points

All answers are attempted. Three of the four answers are correct. (If the answer to part c is incorrect, consider the answer to part d correct if the calculation and comparison are done correctly using the incorrect circumference from part c. If the answer to part a is incorrect, consider the answer to part d correct if the comparison is done correctly using the volume from part a.)

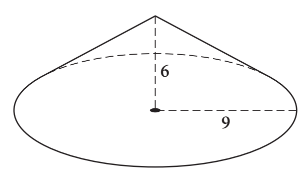
1 Point

At least three answers are attempted, and at least one answer is correct.

3. 5 Points

Answers are correct. Work and explanations are clear and easy to follow.

a. $V = \frac{1}{3}\pi \cdot 9^2 \cdot 6 = 162\pi$ units^3, or about 508.9 units^3.



b. (3, 2); Possible steps:

- Find the equation for the median from P to $\overline{RQ}$. The median passes through (0, 0) and (4.5, 3). Its slope is $\frac{3}{4.5}$, or $\frac{2}{3}$, and its y-intercept is 0, so its equation is $y = \frac{2}{3}x$.
- Find the equation for the median from R to $\overline{PQ}$. The median passes through (0, 6) and (4.5, 0). Its slope is $\frac{-6}{4.5}$, or $-\frac{4}{3}$, and its y-intercept is 6, so its equation is $y = -\frac{4}{3}x + 6$.

- Solve the system to find the point where the medians intersect.

$$\begin{cases} y = \frac{2}{3}x \\ y = -\frac{4}{3}x + 6 \end{cases}$$

$\frac{2}{3}x = -\frac{4}{3}x + 6$	Substitute $\frac{2}{3}x$ for y in the second equation.
$2x = 6$	Add $\frac{4}{3}x$ to both sides.
$x = 3$	Divide both sides by 2.
$y = \frac{2}{3}(3) = 2$	Substitute 2 for x in $y = \frac{2}{3}x$.

The medians intersect at (3, 2). This is the centroid of the triangle.

c. The distance the centroid travels is 6π units, or about 18.85 units, the circumference of a circle with radius 3.

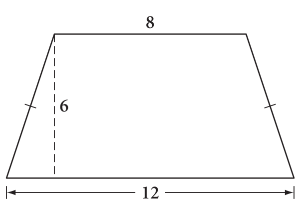
d. Area of $\triangle PQR \cdot 6\pi = 27 \cdot 6\pi = 162\pi$ units^3, or about 508.9 units^3; this is the same as the volume from part a.

3 Points
The answer to part a is correct. A reasonable method is attempted in part b, but the solution is wrong due to calculation errors. Correct methods are used for parts c and d, but the answers are wrong because they are based on the wrong centroid from part b.

1 Point
The answer to part a is complete and correct. The method and answer in part b are incorrect. Parts c and d are incorrect.

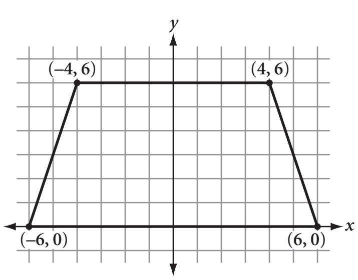
4. 5 points

a.

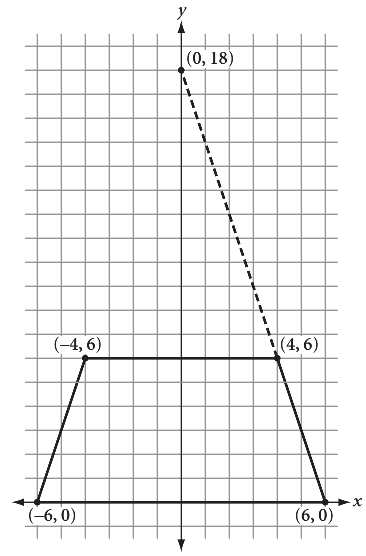


Isosceles trapezoid

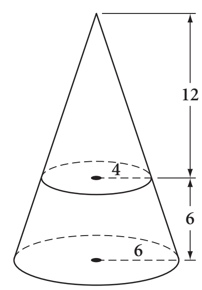
b.



c.



d. The frustum is the bottom part of the cone shown.



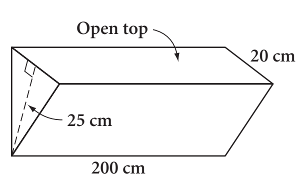
The volume of the frustum is the volume of the large cone minus the volume of the small cone removed from the top.

$$V_{\text{frustum}} = \frac{1}{3}\pi \cdot 6^2 \cdot 18 - \frac{1}{3}\pi \cdot 4^2 \cdot 12$$
$$= 152\pi \text{ units}^3 \approx 477.5 \text{ units}^3$$

3 Points
The procedure is followed, but the answer to part c is incorrect, and as a result, the answer to part d is also incorrect.

1 Point
The answer to part a is correct. The other parts are attempted, but the answers are incorrect.

5. 5 Points
Answer is correct. Explanation is clear and correct. Possible answer: In order to float, 50 kg of steel (50,000 g) must displace more than 50,000 cm^3 of water. (The displaced water has a mass of 50,000 g.) So, we need a triangular prism with a volume greater than 50,000 cm^3. One possibility is:



This hull has a volume of 50,000 cm^3, so it will sit level with the water. If the volume is increased slightly by making the base height 26 cm, the hull will ride 1 cm above the surface of the water.

3 Points
Design is a triangular prism with a volume greater than or equal to 50,000 cm^3, but no explanation is given.

1 Point
Answer includes an explanation of what is needed, but no specific design is given. Or, design shows an absurdly large prism that will float, but no explanation is given.

6. 5 Points
Answers are correct. Work and explanations are clear and easy to follow. Recommendation is supported by facts.

a. i. Hemisphere: Surface area is about 88.2 ft^2. Tallest person is about 6.1 ft. Possible explanation:

First, find the radius of the hemisphere:

$V = \frac{2}{3}\pi r^3$	Volume formula for a hemisphere.
$60 = \frac{2}{3}\pi r^3$	Substitute the known volume.
$\frac{90}{\pi} = r^3$	Divide both sides by $\frac{2}{3}\pi$.
$3.06 \approx r$	Take the cube root of both sides.

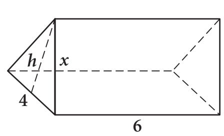
The radius of the tent is about 3.06 feet. Use this value to find the surface area.

$SA = 2\pi r^2 + \pi r^2$	Volume formula for a hemisphere, including the base.

$SA \approx 2\pi(3.06)^2 + \pi\,(3.06)^2 \approx 88.2\text{ ft}^2$

A person will have the most room to stretch out if he or she lies on the diameter of the base, which measures about 6.1 ft. So, the tallest person that could stretch out would be about 6.1 ft tall.

ii. Triangular prism: Surface area is about 109 ft^2. Tallest person is about 7.2 ft. Possible explanation:



Find the height of the triangular base.

$V = Bh$	Volume formula for a prism.
$60 = \left(\frac{1}{2} \cdot 4 \cdot h\right)(6)$	Substitute the known volume and use the area formula for a triangle.
$60 = 12h$	Simplify.
$5 = h$	Divide both sides by 12.

The height of the triangular base is 5 ft.

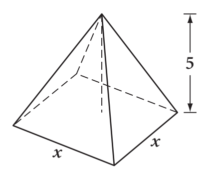
Using the Pythagorean Theorem, the length of each of the congruent sides of the triangular base, x, is $\sqrt{2^2 + 5^2}$, or about 5.39 ft.

The surface area is the sum of the areas of the faces.

$$SA \approx 4(6) + 2(5.39 \cdot 6) + 2\left(\frac{1}{2} \cdot 4 \cdot 5\right)$$
$$\approx 109\text{ ft}^2$$

A person will have the most room to stretch out if he or she lies along the diagonal of the rectangular floor. Using the Pythagorean Theorem, the length of the diagonal is $\sqrt{4^2 + 6^2}$, or about 7.2 ft. So, the tallest person would be about 7.2 ft tall.

iii. Square pyramid: Surface area is about 106 ft^2. Tallest person is about 8.5 ft. Possible explanation:



Find the side lengths of the base.

$V = \frac{1}{3}Bh$	Volume formula for a pyramid.
$60 = \frac{1}{3}x^2(5)$	Substitute the known values and use the area formula for a square.
$36 = x^2$	Divide both sides by $\frac{5}{3}$.
$6 = x$	Take the square root of both sides.

The surface area is the sum of the faces. To find the area of each triangular face, you need the height of the triangle. Form a right triangle with the altitude of a triangular face as the hypotenuse and the altitude of the pyramid as one leg. Using the Pythagorean Theorem, the altitude of a triangular face is $\sqrt{3^2 + 5^2}$, or about 5.83 ft.

$$SA \approx 6^2 + 4\left(\frac{1}{2} \cdot 6 \cdot 5.83\right) \approx 106\text{ ft}^2$$

A person will have the most room to stretch out if he or she lies along the diagonal of the base. Using the Pythagorean Theorem, the length of this diagonal is $\sqrt{6^2 + 6^2}$, or about 8.5 ft. So, the tallest person would be about 8.5 ft tall.

b. Recommendations will vary. Possible answer: The hemisphere takes the least material but has only about 3.1 ft maximum head room, and a person over 6.2 ft cannot stretch out. The other two tents seem more practical. Both have about the same amount of head room, but the pyramid uses less material and has more room to stretch out. I would recommend that the company produce the pyramid tent.

3 Points
Calculations are correct, but no recommendation or summary is given. Or, there are errors in one of the calculations, so a recommendation is based on incorrect findings.

1 Point
Two calculations are incorrect. Recommendations are made but are invalid.

CHAPTER 11 • Quiz 1 — Form A

1. 116 ft

2. No; $\frac{36}{26} \neq \frac{60}{50}$, so corresponding side lengths are not proportional.

3. No; $m\angle E = 38°$ while $m\angle Y = 28°$, so corresponding angles are not equal.

4. $\triangle ABC \sim \triangle EDC$ by AA

5. Not enough information

6. $\triangle KLM \sim \triangle MNO$ by SSS

7. 15 cm

CHAPTER 11 • Quiz 1 — Form B

1. 130.5 ft

2. No; $\frac{45}{30} \neq \frac{67}{42}$, so corresponding side lengths are not proportional.

3. Yes, by AA

4. $\triangle ABC \sim \triangle DEC$ by AA

5. $\triangle KLM \sim \triangle MON$ by SSS

6. Not enough information

7. 36 cm

CHAPTER 11 • Quiz 2 — Form A

1. 90 ft **2.** 30 m

3. $\triangle ABC \sim \triangle JHG$; AA **4.** 14 cm

5. $DE = 21$ cm, $AG = 24$ cm, $CF = 32$ cm

CHAPTER 11 • Quiz 2 — Form B

1. 91 ft **2.** 16 m

3. $\triangle ABC \sim \triangle EDF$; AA **4.** 22.5 cm

5. $DE = 18$ cm, $CG = 24$ cm, $BF = 16$ cm

CHAPTER 11 • Quiz 3 — Form A

1. 2:3 **2.** 15 cm **3.** 175 in^2 **4.** 20 cm^3

5. $\frac{32}{3}$ in., or $10\frac{2}{3}$ in. **6.** $x = 20$ cm; $y = 20$ cm

CHAPTER 11 • Quiz 3 — Form B

1. 3:4 **2.** 8 cm **3.** 300 in^2 **4.** 30 cm^3

5. $\frac{25}{3}$ in., or $8\frac{1}{3}$ in. **6.** $x = 25$ cm; $y = 16$ cm

CHAPTER 11 • Test — Form A

Part A

1. False **2.** True **3.** False **4.** True

5. False

Part B

1. 35 cm **2.** 126 cm **3.** $\frac{p}{q}$ **4.** 78 cm

5. $w = 48$ cm, $x = 36$ cm, $y = 60$ cm, $z = 189$ cm

6. $10{,}000\pi$ cm^3

Part C

1. 14 ft **2.** $\frac{a^2}{b^2}$ **3.** 3:4

Part D

The vertices of the image are $A'(0, 1)$, $B'(3, 1)$, and $C'(0, 3)$.

1. 2:1 **2.** 4:1

Mixed review

1. $m\angle 1 = 95°$, $m\angle 2 = 31°$

2. a. Given

b. $\angle B$

c. Alternate Interior Angles Conjecture

d. $\overline{AC} \cong \overline{BD}$

e. $\angle AMC \cong \angle BMD$

f. $\triangle AMC \cong \triangle BMD$

g. SAA

h. CPCTC

i. $\overline{CM} \cong \overline{MD}$

j. CPCTC

3. a. $g = 12$ cm, $h = 6\sqrt{2}$ cm, $k = 6\sqrt{6}$ cm

b. $288 + 144\sqrt{3} + 288\sqrt{2}$ cm^2 ≈ 944.7 cm^2

c. 1152 cm^3

4. 4.0 g/cm^2

5. Dodecagon (12 sides)

6. $f(n) = 4n - 13$

CHAPTER 11 • Test Form B

Part A

1. True **2.** True **3.** False **4.** True

5. True

Part B

1. 18.9 cm **2.** 69 cm **3.** $\frac{q}{r}$ **4.** 32 cm

5. $w = 10$ cm, $x = 21.6$ cm, $y = 6$ cm, $z = 31.4$ cm

6. 160π cm^3

Part C

1. $\frac{a^2}{b^2}$ **2.** 3:5 **3.** $37\frac{1}{3}$ ft, or 37 ft 4 in.

Part D

The vertices of the image are $A'(0, 1)$, $B'(3, 1)$, and $C'(0, 3)$.

1. 3:1 **2.** 9:1

Mixed review

1. $m\angle 1 = 79°$, $m\angle 2 = 31°$

2. a. Given

b. Definition of bisect

c. $\angle AMC \cong \angle BMD$

d. $\overline{CM} \cong \overline{MD}$

e. $\triangle AMC \cong \triangle BMD$

f. SAS

g. $\angle A \cong \angle B$ (or $\angle C \cong \angle D$)

h. CPCTC

i. Converse of AIA

3. a. $f = 8$ cm, $g = 4\sqrt{6}$ cm, $h = 4\sqrt{2}$ cm

b. $128 + 64\sqrt{3} + 128\sqrt{2}$ cm^2 ≈ 419.9 cm^2

c. $\frac{1024}{3} \approx 341.3$ cm^3

4. 4.5 g/cm^2

5. Hexagon (6 sides)

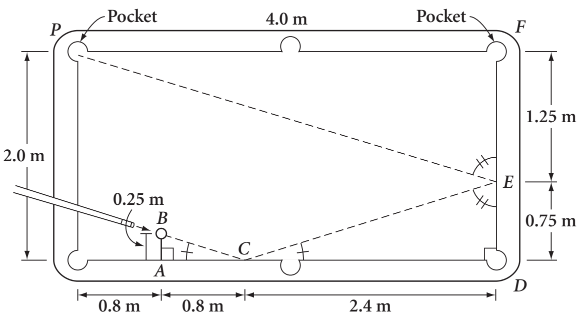
6. $f(n) = -3n + 1$

CHAPTER 11 • Constructive Assessment Options

Scoring rubrics

1. 5 Points

Answer states that the ball will go in the pocket. Diagram correctly shows path and indicates the location of all contact points. Explanation is clear and correct. Possible diagram and explanation:



$\angle ACB \cong \angle DCE$ (angle of incidence $\cong$ angle of reflection), and $\angle A \cong \angle D$ because they are both right angles. Therefore, $\triangle ABC \sim \triangle DEC$ by the AA Similarity Conjecture. $CD = 3AC$, so $DE = 3AB$, and $DE = 0.75$ m.

Similarly, $\triangle DEC \sim \triangle FEP$. Assume for the moment we don't know P is at the corner, only that it is somewhere along the side. Because $FE = \frac{5}{3}ED$, $PF = \frac{5}{3}DC$. Because $DC = 2.4$ cm, $PF = 4.0$ cm, which means P is at the corner.

3 Points

The path and contact points are found. The explanation is attempted, but the reasoning is not clear.

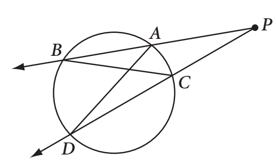
1 Point

Part of the path (up to point E in the diagram above) is correct. The rest of the path is incorrect. Explanation is missing or incorrect.

2. 5 Points

a. Measures will vary, but the two products should be the same (or approximately the same).

b. Inscribed angles $\angle B$ and $\angle D$ intercept the same arc, so $\angle B \cong \angle D$. Also, $\angle P \cong \angle P$ because they are the same angle. Therefore, by the AA Similarity Conjecture, $\triangle PBC \sim \triangle PDA$.



c. Because $\triangle PBC \sim \triangle PDA$, the corresponding sides are proportional. Therefore, $\frac{PB}{PD} = \frac{PC}{PA}$. By multiplying both sides by $PD \cdot PA$, it follows that $PA \cdot PB = PC \cdot PD$.

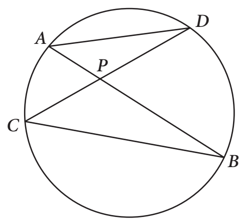
3 Points
The answers to parts a and b are correct and complete. The explanation in part c is incorrect.

1 Point
The answer to part a is correct and complete. The explanation in part b is attempted but is incomplete or incorrect. The answer to part c is not attempted.

3. **5 Points**

a. Measures will vary, but the two products should be the same (or approximately the same).

b. $\angle APD \cong \angle CPB$ by the VA Conjecture. $\angle PAD \cong \angle PCB$ because they intercept the same arc. Therefore, by the AA Similarity Conjecture, $\triangle PBC \sim \triangle PDA$.



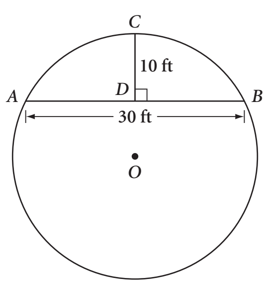
c. Because $\triangle PBC \sim \triangle PDA$, it follows that the corresponding sides are proportional. Therefore, $\frac{PB}{PD} = \frac{PC}{PA}$. By multiplying both sides by $PD \cdot PA$, it follows that $PA \cdot PB = PC \cdot PD$.

3 Points
The answers to parts a and b are correct and complete. The explanation in part c is incorrect.

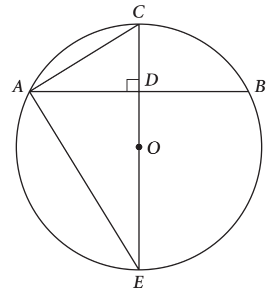
1 Point
The answer to part a is correct and complete. The explanation in part b is attempted but is incomplete or incorrect. The answer to part c is not attempted.

4. **5 Points**
Answer and explanation are correct and complete.

a.



b. The radius is 16.25 ft. Possible explanation: Extend $\overline{CD}$ through O to E. ($\overleftrightarrow{CD}$ passes through O because it is the perpendicular bisector of chord $\overline{AB}$.) $\angle CDA \cong \angle ADE$ because both are right angles. $\angle CAB \cong \angle E$ because their intercepted arcs, $\overset{\frown}{AC}$ and $\overset{\frown}{CB}$, are congruent. Therefore, $\triangle ACD \sim \triangle EAD$ by the AA Similarity Conjecture. Because the triangles are similar, their sides are proportional. So $\frac{CD}{AD} = \frac{AD}{DE}$. Substituting the known values, $\frac{10}{15} = \frac{15}{DE}$, so $DE = 22.5$ ft. Therefore, the diameter, CE, is 32.5 ft, so the radius is 16.25 ft.



3 Points
Diagram in part a is correct. A correct method is used in part b, but the answer is wrong because of a computation error, or the answer is correct but explanation is incomplete or unclear.

1 Point
Diagram in part a is correct. Part b is attempted, but the explanation and answer are incorrect.

5. **5 Points**

a. $D(10, 0)$; Possible explanation: $\overline{BC}$ is vertical, so $\overline{AD}$ is horizontal. If you draw a horizontal line through point A, it will intersect the line containing $\overline{BC}$ at $(10, 0)$. So, the coordinates of point D are $(10, 0)$.

b. $M(10, 8)$; Possible explanation: M is the midpoint of $\overline{BC}$, so its coordinates are $\left(\frac{10+10}{2}, \frac{12+4}{2}\right)$, or $(10, 8)$.

c. $E(10, 7.26)$; Possible explanation: E is on the vertical line $x = 10$, so its coordinates are of the form $(10, y)$. By the Angle Bisector/Opposite Sides Conjecture, $\frac{AC}{AB} = \frac{EC}{EB}$. Using the distance formula, $AC = \sqrt{244}$ and $AB = \sqrt{116}$. Because C, E, and B are on the same vertical line, you can find the distances between them by subtracting y-coordinates. $EC = 12 - y$ and $EB = y - 4$. Now you can set up and solve an equation.

$$\frac{AC}{AB} = \frac{EC}{EB}$$

$$\frac{\sqrt{244}}{\sqrt{116}} = \frac{12 - y}{y - 4}$$

$$y\sqrt{244} - 4\sqrt{244} = 12\sqrt{116} - y\sqrt{116}$$

$$\left(\sqrt{244} + \sqrt{116}\right)y = 12\sqrt{116} + 4\sqrt{244}$$

$$y = \frac{12\sqrt{116} + 4\sqrt{244}}{\sqrt{244} + \sqrt{116}} \approx 7.26$$

So, the coordinates are approximately $(10, 7.26)$

d. $AD = 10$; $AB \approx 10.77$; $AM \approx 12.81$; $AE \approx 12.36$; $AC \approx 15.62$; Work is shown for all lengths. Sample work: To find AB, use the distance formula.

$$AB = \sqrt{(10-0)^2 + (4-0)^2} = \sqrt{116} \approx 10.77$$

3 Points

Coordinates of points D and M are correct, and work and explanations are clear. Work indicates that student attempted to use the Angle Bisector/Opposite Sides Conjecture to find the coordinates of point E, but the coordinates are incorrect. Most of the lengths in part d are correct.

1 Point

Coordinates of points D or M are correct. An incorrect method was used to find the coordinates of point E. Some of the lengths in part d are correct.

6. 5 Points

a. At 50%, the area of the image will be $(0.5)^2(864)$, or 216 cm^2. At 125%, the area of the image will be $(1.25)^2(864)$, or 1350 cm^2. At 80%, the area of the image will be $(0.8)^2(864)$, or 552.96 cm^2. Possible explanation: $\triangle ABC$ is a right triangle with area $\frac{1}{2}(36)(48)$, or 864 cm^2. The image after an enlargement or reduction will be similar to the original, and its area will be $(\textit{setting}\ \%)^2(\textit{area of}\ \triangle ABC)$.

b. 141%; Possible explanation: To double the area, the square of the setting must equal 2: $(\textit{setting}\ \%)^2 = 2$, so $\textit{setting}\ \% = \sqrt{2} = 1.414\ldots \approx 141\%$.

c. 39%; Possible explanation: For the shorter leg of $\triangle ABC$ to fit on the 14 cm side of the paper, 36 cm must be reduced to 14 cm. So, $36 \cdot \textit{setting}\ \% = 14$, or $\textit{setting}\ \% \approx 39\%$. For the longer leg to fit on the 19 cm side, $48 \cdot \textit{setting}\ \% = 19$, or $\textit{setting}\ \% \approx 40\%$. You need to use the setting that makes both legs fit, so use 39%. (If you use 40%, the shorter leg will be too long to fit.)

3 Points

Answers to parts a and b are correct. Part c is attempted, but the answer is not correct.

1 Point

At least two answers to part a are correct. Part b is attempted, but the answer is incorrect. The answer to part c is missing or is incorrect.

7. 5 Points

Answer and explanation are correct and complete.

a. $PA = 9$ cm, $LQ = 2$ cm, $QB = 6$ cm, $LR = 4$ cm, $RC = 12$ cm

b. $\frac{\text{Surface area of small pyramid}}{\text{Surface area of large pyramid}} = \frac{1}{16}$;

$\frac{\text{Volume of small pyramid}}{\text{Volume of large pyramid}} = \frac{1}{64}$; Possible explanation: The pyramids are similar, so the ratio of the surface areas is the ratio of the squares of the edge lengths and the ratio of the volumes is the ratio of the cubes of the edge lengths.

c. Possible explanation: On face $\triangle LAB$ $\overline{PQ} \parallel \overline{AB}$. So $\triangle LPQ \sim \triangle LAB$. Therefore, $\frac{PQ}{AB} = \frac{LQ}{LB} = \frac{1}{4}$. Using the same reasoning with faces $\triangle LBC$ and $\triangle LQR$ gives $\frac{QR}{BC} = \frac{1}{4}$ and with faces $\triangle LCA$ and $\triangle LRP$ gives $\frac{RP}{CA} = \frac{1}{4}$. Therefore, the sides of $\triangle PQR$ and $\triangle ABC$ are proportional, and by the SSS Similarity Conjecture, the triangles are similar.

3 Points

The answers to parts a and b are complete and correct. The explanation in part c is attempted but is incomplete or incorrect.

1 Point

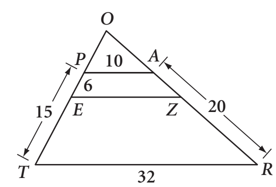
The answer to one part is complete and correct. The answers to parts b and c are attempted but incorrect, or are missing.

8. 5 Points

Answers and explanations are correct and complete.

a. $AZ = 8$; Possible explanation: Parallel lines cut the lines they intersect proportionally, so $\frac{6}{9} = \frac{AZ}{20 - AZ}$. Solving this equation gives $AZ = 8$.

b. $\overleftrightarrow{PA} \parallel \overleftrightarrow{TR}$, so by the CA Conjecture, $\angle OPA \cong \angle T$ and $\angle OAP \cong \angle R$. Thus, by the AA Similarity Conjecture, $\triangle OPA \sim \triangle OTR$. The ratio of corresponding sides is $\frac{10}{32}$, or $\frac{5}{16}$.



c. $OP = 6\frac{9}{11}$; Possible explanation: $\frac{OP}{PA} = \frac{OT}{TR}$, so $\frac{OP}{10} = \frac{OP + 15}{32}$. Solving this equation gives $OP = 6\frac{9}{11}$.

$OA = 9\frac{1}{11}$; Possible explanation: $\frac{OA}{PA} = \frac{OR}{TR}$, so $\frac{OA}{10} = \frac{OA + 20}{32}$. Solving this equation gives $OA = 9\frac{1}{11}$.

d. $EZ = 18\frac{4}{5}$; Possible explanation: Using the CA Conjecture and the AA Similarity Conjecture, $\triangle OEZ \sim \triangle OTR$. So, $\frac{EZ}{TR} = \frac{OE}{OT}$. Substituting the known values, this becomes $\frac{EZ}{32} = \frac{12\frac{9}{11}}{21\frac{9}{11}}$. Solving this equation gives $EZ = 18\frac{4}{5}$.

3 Points

The answers and explanations for parts a and b are correct and complete. Parts c and d are attempted, but the answers are incorrect.

1 Point

The answer to part a is correct and complete. Parts b and c are attempted, but the answers are incorrect. The answer to part d is missing or is incorrect.

CHAPTER 12 • Quiz 1 Form A

1. $\sin Q = \frac{3}{5}$, $\cos Q = \frac{4}{5}$, $\tan Q = \frac{3}{4}$ **2.** 16 m

3. 69 mm^2 **4.** 64° **5.** 28° **6.** 286 ft

CHAPTER 12 • Quiz 1 Form B

1. $\sin P = \frac{1}{\sqrt{2}}$, or $\frac{\sqrt{2}}{2}$, $\cos P = \frac{\sqrt{2}}{2}$, $\tan P = 1$

2. 22 cm **3.** 483 mm^2

4. 42° **5.** 62° **6.** 186 ft

CHAPTER 12 • Quiz 2 Form A

1. 95 ft^2 **2.** 47° **3.** 10 cm **4.** 15 m

5. 82° **6.** 15.2 mi

CHAPTER 12 • Quiz 2 Form B

1. 76 ft^2 **2.** 58° **3.** 80° **4.** 17 km

5. 70 m **6.** 14.6 mi

CHAPTER 12 • Test Form A

Part A

1. $\sin R = \frac{r}{s}$, $\cos R = \frac{t}{s}$ **2.** $\cos B = \frac{15}{17}$, $\tan B = \frac{8}{15}$

3. $\sin C = \frac{1}{\sqrt{2}}$, or $\frac{\sqrt{2}}{2}$, $\tan C = 1$

Part B

1. 0.8387 **2.** 0.9877 **3.** 33° **4.** 86°

Part C

1. 113 m **2.** 270 ft **3.** 94 m **4.** 10,400 m

5. 67° **6.** 57 m

Mixed review

1. a. True

b. False; $\frac{9}{21} \neq \frac{6}{16}$

c. False; $\frac{9}{30} \neq \frac{6}{22}$

d. True

2. $w = 4\sqrt{2}$ cm, $x = 2\sqrt{2}$ cm, $y = 2\sqrt{6}$ cm, $z = 2\sqrt{3}$ cm

3. $ABCD$ is an isosceles trapezoid. $\overline{AB}$ and $\overline{CD}$ both have slope 1, so they are parallel. $\overline{AD}$ is vertical (has undefined slope) and $\overline{BC}$ is horizontal (has slope 0), so they are not parallel. A quadrilateral with exactly one pair of parallel opposite sides is a trapezoid. $AD = BC = 4$ units, so $ABCD$ is an isosceles trapezoid.

4. $\triangle ABC$ and $\triangle BED$ are right triangles with hypotenuses $\overline{AC}$ and $\overline{BD}$. Using the Pythagorean Theorem, $(AB)^2 + (BC)^2 = (AC)^2$ and $(BE)^2 + (ED)^2 = (BD)^2$. Solve each equation for the leg to get $BC = \sqrt{(AC)^2 - (AB)^2}$ and $DE = \sqrt{(BD)^2 - (BE)^2}$. It is given that $\overline{AB} \cong \overline{BE}$ and $\overline{AC} \cong \overline{BD}$, so by the definition of congruent segments, $AB = BE$ and $AC = BD$. Substitute into the first equation to get $BC = \sqrt{(BD)^2 - (BE)^2}$. By substitution, $BC = DE$, so $\overline{BC} \cong \overline{BE}$. Therefore, $\triangle ABC \cong \triangle BED$ by SSS.

5. Surface area $= 6\pi$ in^2; volume $= \frac{3\pi}{2}$ in^3

6. $OP = 12$ cm, $TM = 3\sqrt{3}$ cm, $AE = 6$ cm, $BT = 6\sqrt{2}$ cm, $m\angle TKO = 15°$

CHAPTER 12 • Test Form B

Part A

1. $\sin T = \frac{t}{s}$, $\cos T = \frac{r}{s}$ **2.** $\cos B = \frac{12}{13}$, $\tan B = \frac{5}{12}$

3. $\sin C = \frac{1}{\sqrt{2}}$, or $\frac{\sqrt{2}}{2}$, $\tan C = 1$

Part B

1. 0.8829 **2.** 0.9455 **3.** 22° **4.** 42°

Part C

1. 77° **2.** 95 m **3.** 85 m **4.** 158 m

5. 88 km **6.** 34 m

Mixed review

1. a. True

b. False; $\frac{12}{23} \neq \frac{9}{18}$

c. True

d. False; $\frac{12}{35} \neq \frac{9}{27}$

2. $w = 6\sqrt{2}$ cm, $x = 3\sqrt{2}$ cm, $y = 3\sqrt{6}$ cm, $z = 3\sqrt{3}$ cm

3. $ABCD$ is an isosceles trapezoid. $\overline{BC}$ and $\overline{AD}$ both have slope -1, so they are parallel. $\overline{AB}$ is vertical (has undefined slope) and $\overline{CD}$ is horizontal (has slope 0), so they are not parallel. A quadrilateral with exactly one pair of parallel opposite sides is a trapezoid. $AB = CD = 5$ units, so $ABCD$ is an isosceles trapezoid.

4. $\triangle EDC$ and $\triangle EFC$ are right triangles with shared hypotenuse $\overline{EC}$. Using the Pythagorean Theorem, $(ED)^2 + (DC)^2 = (EC)^2$ and $(EF)^2 + (FC)^2 = (EC)^2$. Solve each equation for the leg to get $DC = \sqrt{(EC)^2 - (ED)^2}$ and $FC = \sqrt{(EC)^2 - (EF)^2}$. It is given that $\overline{ED} \cong \overline{EF}$, so by the definition of congruent segments, $ED = EF$. Substitute into the first equation to get $DC = \sqrt{(EC)^2 - (EF)^2}$. By substitution, $DC = FC$, so $\overline{DC} \cong \overline{FC}$. Therefore, $\triangle EDC \cong \triangle EFC$ by SSS.

5. Surface area $= 9\pi$ in^2; volume $= 2\pi$ in^3

6. $OP = 20$ cm, $TM = 5\sqrt{3}$ cm, $AE = 10$ cm, $BT = 10\sqrt{2}$ cm, $m\overset{\frown}{BC} = 30°$

SCORING RUBRICS

1. 5 Points

Answer and explanation are correct and complete.

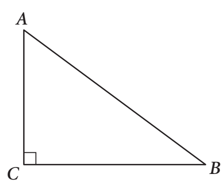
a. $\sin 23° = 0.3907$ $\cos 67° = 0.3907$
$\sin 40° = 0.6428$ $\cos 50° = 0.6428$
$\sin 72° = 0.9511$ $\cos 18° = 0.9511$
$\sin 5° = 0.0872$ $\cos 85° = 0.0872$

b. The angle measures are complementary. The sine and cosine values are equal. Angle pairs tested will vary, but the angles should be complementary, and the sine and cosine values should be equal.

c. The sine of an acute angle and the cosine of its complement are equal.

d. Possible explanation: By the Triangle Sum Conjecture, $m\angle A + m\angle B = 180° - 90° = 90°$. Thus, $\angle A$ and $\angle B$ are complementary. The leg opposite $\angle A$ is the leg adjacent to $\angle B$, so

$$\sin A = \frac{\text{length of leg opposite } \angle A}{\text{length of hypotenuse}}$$
$$= \frac{\text{length of leg adjacent to } \angle B}{\text{length of hypotenuse}} = \cos B$$



3 Points

Answers to parts a–c are complete and correct. Explanation in part d is unclear or is incomplete.

1 Point

Answer to part a is correct. Relationship stated in part b is correct, but no additional angle pairs are tested. Answers to parts c and d are incorrect.

2. 5 Points

The forms of the radical expressions may vary.

a.

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45°	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$

b. $$\sin^2 30° + \cos^2 30° = \left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1$$

$$\sin^2 45° + \cos^2 45° = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2} + \frac{1}{2} = 1$$

$$\sin^2 60° + \cos^2 60° = \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 = \frac{3}{4} + \frac{1}{4} = \frac{4}{4} = 1$$

c. $$\frac{\sin 30°}{\cos 30°} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}} = \tan 30°$$

$$\frac{\sin 45°}{\cos 45°} = \frac{\frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}}} = 1 = \tan 45°$$

$$\frac{\sin 60°}{\cos 60°} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{\sqrt{3}}{1} = \tan 60°$$

3 Points

Answer to part a complete and correct. Parts b and c are attempted, but student is not able to simplify the radical expressions and fractions.

1 Point

Answer to part a is mostly correct. Parts b and c are incorrect or not attempted.

3. 5 Points

Answer and explanation are correct and complete.

a. Possible answer: The area of $\triangle OAP$ starts at 0, increases to a maximum, decreases back to 0, increases to a maximum, and then decreases back to 0.

b. $OD = r \sin P$

c. $AP = 2r \cos P$

d. Area of $\triangle OAP = \frac{1}{2}(2r\cos P)(r\sin P) = r^2 \sin P \cos P$

e. Angles and areas will vary. The area is greatest when $m\angle P = 45°$. The maximum area is 0.5 square units.

3 Points

Answers to parts a–c are correct. Expression in part d is incorrect, and as a result, answer to part e is not correct.

1 Point

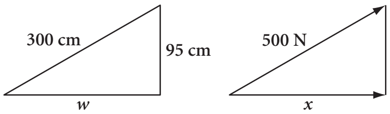
Two of the three answers in parts a–c are correct. Answers to parts d and e are missing or are incorrect.

4. 5 Points

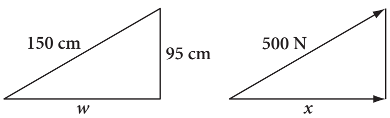
Answers, sketches, and explanations are correct and complete.

a. Yes, Albert will move the crate. Possible explanation: First, use the Pythagorean Theorem to find w: $w = \sqrt{300^2 - 95^2} \approx 285$ cm. Now use similar triangles to find the horizontal force,

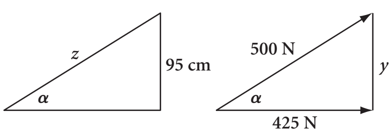
x: $\frac{300}{285} \approx \frac{500}{x}$ $\left(\text{or } \frac{300}{500} \approx \frac{285}{x}\right)$, so $x \approx 475$ newtons. The horizontal force needs to be only 425 newtons for the crate to move, so the crate will move.



b. No, Albert will not move the crate. Possible sketches and explanation: First, use the Pythagorean Theorem to find w: $w = \sqrt{150^2 - 95^2} \approx 116$ cm. Now use similar triangles to find the horizontal force, x: $\frac{150}{116} \approx \frac{500}{x}$, so $x \approx 387$ newtons. The horizontal force needs to be 425 newtons for the crate to move, so the crate will not move.



c. The rope length is about 180 cm and angle measure is about 32°. Answers may vary slightly, depending on the method used and on how and when the student rounded. Possible explanation: Use the Pythagorean Theorem to find y: $y = \sqrt{500^2 - 425^2} \approx 263$ newtons. Now use similar triangles to find z: $\frac{z}{95} \approx \frac{500}{y}$, so $z \approx 180$ cm. To find α, use the inverse cosine: $\alpha = \cos^{-1}\left(\frac{425}{500}\right) \approx 32°$.

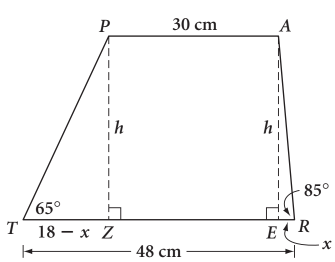


3 Points
Answer and explanation in parts a and b are complete and correct. A correct method is attempted in part c, but the answer is incorrect.

1 Point
Sketches in parts a and b are correct, but answers and explanations are incorrect or incomplete. Part c is attempted but is incorrect.

5. **5 Points**
Answers and explanations are correct and complete.

a. $TZ = 18 - x$



b. Equations should be equivalent to $h = (18 - x)\tan 65°$ and $h = x\tan 85°$.

c. $x \approx 2.84$ cm, $h \approx 32.50$ cm (Answers may vary slightly, depending on when and how students rounded.) Possible method: Substitute the expression for h into the first equation.

$$x\tan 85° = \tan 65°(18 - x)$$

$$x\tan 85° = 18\tan 65° - x\tan 65°$$

$$x\tan 85° + x\tan 65° = 18\tan 65°$$

$$x(\tan 85° + \tan 65°) = 18\tan 65°$$

$$x = \frac{18\tan 65°}{\tan 85° + \tan 65°}$$

$$x \approx 2.84 \text{ cm}$$

To find h, substitute the expression for x in the second equation.

$$h = \frac{18\tan 65°}{\tan 85° + \tan 65°} \cdot \tan 85°$$

$$h \approx 32.50 \text{ cm}$$

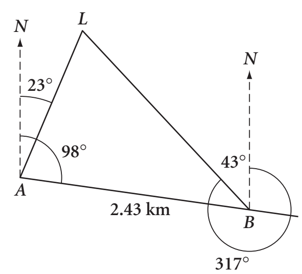
d. Area of $TRAP \approx 1268$ cm^2

3 Points
Answers to parts a and b are correct. An error is made in solving the system in part c. The calculation in part d is done correctly, but the area is incorrect because it is based on the incorrect value of h found in part c.

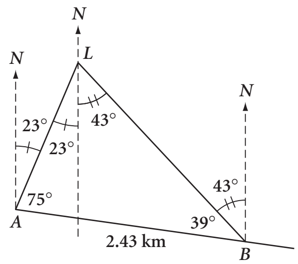
1 Point
Answers to parts a and b are correct. Parts c and d are not attempted or include significant errors.

6. **5 Points**

a. Diagram should be similar to the one below.



b. Albatross: 1.67 km; BaRi: 2.57 km; Possible explanation: $m\angle LAB = 98° - 23° = 75°$. A vertical line through $\angle L$ divides it into two angles. Using the AIA Conjecture, the left part has measure 23° and the right part has measure 43°. So, $m\angle L = 66°$. Using the Triangle Sum Conjecture, $m\angle LBA = 180° - (75° + 66°) = 39°$. Use the Law of Sines to find AL and BL.



$$\frac{AL}{\sin 39°} = \frac{2.43}{\sin 66°}$$
$$AL = \frac{2.43(\sin 39°)}{\sin 66°}$$
$$AL \approx 1.67$$
$$\frac{BL}{\sin 75°} = \frac{2.43}{\sin 66°}$$
$$BL = \frac{2.43(\sin 75°)}{\sin 66°}$$
$$BL \approx 2.57$$

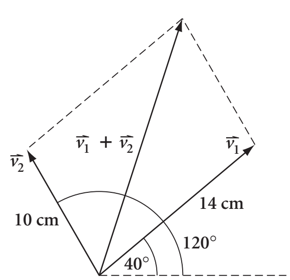
The Albatross is 1.67 km from the lighthouse, and the BaRi is 2.57 km from the lighthouse.

3 Points
Diagram in part a is complete and correct. A correct procedure is used in part b, but one or both distances are incorrect due to a computation error.

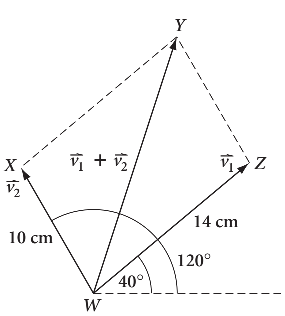
1 Point
Diagram in part a is complete and correct. Procedure used in part b is not clear, and answers are incorrect.

7. 5 Points
Sketch and answers are correct. Explanations are clear and correct.

a. Possible sketch:



b. 18.56 cm; Possible explanation: For convenience, label the vertices of the parallelogram.



$m\angle XWZ = 120° - 40° = 80°$. Because the measures of consecutive angles of a parallelogram are supplementary, $m\angle WXY = 100°$. Use the Law of Cosines to find WY, which is the magnitude of $\vec{v}_1 + \vec{v}_2$.

$c^2 = a^2 + b^2 - 2ab\cos C$	Law of Cosines.
$WY^2 = 10^2 + 14^2 - 2(10)(14)\cos 100°$	Substitute.
$WY = \sqrt{10^2 + 14^2 - 2(10)(14)\cos 100°}$	Take the positive square root.
≈ 18.56	Evaluate.

The magnitude of $\vec{v}_1 + \vec{v}_2$ is 18.56 cm.

c. 72°; Possible explanation: Using the diagram, the direction of $\vec{v}_1 + \vec{v}_2$ is $120° - m\angle XWY$. Use the Law of Sines to find $m\angle XWY$.

$\frac{\sin 100°}{18.56} \approx \frac{\sin(m\angle XWY)}{14}$	Law of Sines with given values.
$m\angle XWY \approx \sin^{-1}\left(14 \cdot \frac{\sin 100°}{18.56}\right)$	Multiply and take the inverse sine.
$\approx 48°$	Evaluate.

The direction of $\vec{v}_1 + \vec{v}_2$ is $120° - 48°$, or 72°.

3 Points
Sketch in part a is clear and correct. Parts b and c are completed using the correct procedure, but one or both answers are incorrect due to a minor computation error. Or, the magnitude in part b is correct, but the angle in part c is incorrect.

1 Point
Sketch in part a is clear and correct. Parts b and c are attempted, but incorrect methods are used.

CHAPTERS 10–12 • Exam — Form A

Part A

1. False	**2.** False	**3.** True	**4.** False
5. True	**6.** False	**7.** True	**8.** False

Part B

1. congruent; proportional	**2.** 35 cm^2
3. πx^2 cm^3	**4.** parallel
5. mass; volume	**6.** $\frac{512}{729}$
7. $\frac{3}{4}$	**8.** 54 cm^2

Part C

1. 175.9 cm^3	**2.** $x = 18$ cm, $y = 12$ cm
3. 21.8 cm	**4.** 10 cm

5. 51.4 cm^3

6. 11.1 cm

7. 3 cm

8. 34.6°

9. 23.5 cm

Part D

1. 8.97 g/cm^3

2. 84 ft

3. 66 m

CHAPTERS 10–12 • Exam — Form B

Part A

1. True **2.** True **3.** False

4. True **5.** True **6.** True

7. False **8.** False

Part B

1. congruent; proportional

2. 22 cm^2

3. $\frac{1}{3}\pi x^2$ cm^3

4. proportionally

5. density **6.** $\frac{16}{9}$ **7.** $\frac{3}{5}$

8. 80 cm^2

Part C

1. 432.0 cm^3 **2.** $x = 24$ cm; $y = 9$ cm

3. 15.3 cm **4.** 31.9° **5.** 6.4 cm^3

6. 21.3 cm **7.** 4 cm **8.** 8.7 cm

9. 8.9 cm

Part D

1. 10.5 g/cm^3 **2.** 82 ft **3.** 85 m

CHAPTER 13 • Quiz 1 — Form A

1. theorem

2. postulate

3. transitive

4. Line

5. $ab + ac$

6. a. Corresponding Angles Postulate
b. Vertical Angles Theorem
c. Transitive property of congruence

7. Order of steps may vary.

Statement	Reason
1. $\angle 3 \cong \angle 4$	1. Given
2. $\angle 1$ and $\angle 3$ are supplementary; $\angle 2$ and $\angle 4$ are supplementary	2. Linear Pair Postulate
3. $\angle 1 \cong \angle 2$	3. Supplements of Congruent Angles Theorem
4. $\triangle FAD$ is isosceles	4. Converse of the Isosceles Triangle Theorem

CHAPTER 13 • Quiz 1 — Form B

1. postulate **2.** theorem **3.** premises

4. symmetric **5.** Parallel

6. a. Vertical Angles Theorem
b. Transitive property of congruence
c. CA Postulate

7. Order of steps may vary.

Statement	Reason
1. $\angle 3 \cong \angle 4$	1. Given
2. $\angle 1$ and $\angle 3$ are supplementary; $\angle 2$ and $\angle 4$ are supplementary	2. Linear Pair Postulate
3. $\angle 1 \cong \angle 2$	3. Supplements of Congruent Angles Theorem
4. $\triangle FAD$ is isosceles	4. Converse of the Isosceles Triangle Theorem

CHAPTER 13 • Quiz 2 — Form A

1. a. Given
b. Definition of rectangle
c. Definition of rectangle
d. Opposite Sides Theorem
e. Reflexive property of congruence
f. SAS Congruence Postulate
g. CPCTC

2. a. Line Postulate
b. Given
c. Inscribed Angles Intercepting Arcs Theorem
d. Converse of the AIA Theorem

3. Assume $\overline{CD}$ is an altitude of $\triangle ABC$.

CHAPTER 13 • Quiz 2 — Form B

1. a. Line Postulate
b. Given
c. Reflexive property of congruence
d. SSS Congruence Postulate
e. CPCTC
f. Converse of the AIA Theorem

g. CPCTC
h. Converse of the AIA Theorem
i. Definition of rhombus

2. a. Given
b. Opposite Angles Theorem
c. Given
d. Cyclic Quadrilateral Theorem
e. Congruent and Supplementary Theorem
f. Definition of rectangle

3. Assume *KITE* is a trapezoid

CHAPTER 13 • Test Form A

Part A

1. True	**2.** True	**3.** True	**4.** False
5. False	**6.** False	**7.** True	**8.** True
9. True	**10.** False		

Part B

1. Given **2.** Definition of angle bisector

3. Definition of congruent angles

4. Given **5.** Definition of perpendicular

6. Definition of right angle

7. Triangle Sum Theorem

8. Subtraction property of equality

9. Substitution property of equality

10. Addition property of equality

11. Angle Addition Postulate

12. Angle Addition Postulate

13. Substitution property of equality

14. Definition of supplementary angles

Part C

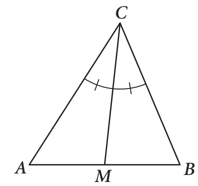
1. Order of steps may vary.

Statement	Reason
1. $\overrightarrow{TE}$ bisects $\angle DTO$	1. Given
2. $\angle 1 \cong \angle 2$	2. Definition of angle bisector
3. $\overline{TE} \parallel \overline{NO}$	3. Given
4. $\angle N \cong \angle 1$	4. CA Postulate
5. $\angle N \cong \angle 2$	5. Transitive property of congruence
6. $\angle 2 \cong \angle O$	6. AIA Theorem
7. $\angle N \cong \angle O$	7. Transitive property of congruence
8. $\triangle NOT$ is isosceles	8. Converse of the Isosceles Triangle Theorem

2. Possible answer:

Given: $\triangle ABC$ is scalene, $\overrightarrow{CM}$ bisects $\angle C$

Show: $\overline{CM}$ is not an altitude



Proof:

Statement	Reason
1. Assume $\overline{CM}$ *is* an altitude	1. Assume the statement is *not* true
2. $\overline{CM} \perp \overline{AB}$	2. Definition of altitude
3. $\angle CMA$ and $\angle CMB$ are right angles	3. Definition of perpendicular
4. $\angle CMA \cong \angle CMB$	4. Right Angles Are Congruent Theorem
5. $\overrightarrow{CM}$ bisects $\angle C$	5. Given
6. $\angle ACM \cong \angle BCM$	6. Definition of angle bisector
7. $\overline{CM} \cong \overline{CM}$	7. Reflexive property of congruence
8. $\triangle AMC \cong \triangle BMC$	8. ASA Congruence Postulate
9. $\overline{AC} \cong \overline{BC}$	9. CPCTC

But the statement $\overline{AC} \cong \overline{BC}$ contradicts the fact that $\triangle ABC$ is scalene. Thus, the assumption that $\overline{CM}$ is an altitude is false. Therefore, $\overline{CM}$ is not an altitude.

Mixed review

1. a. $EC = 4.5$ cm
b. $FC = 6$ cm

2. a. $8\sqrt{3}$ cm^2
b. $\frac{16\pi}{3}$ cm
c. $\left(\frac{64\pi}{3} - 16\sqrt{3}\right)$ cm^2

3. a. $AB \approx 10.3$ cm
b. $AE = 15$ cm
c. Volume $= 360$ cm^3

4. 36.1 m

5. a. Sometimes
b. Never
c. Sometimes
d. Sometimes
e. Always